REPORT RESUMES

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ELEMENTARY ELECTRONICS, AN AUTOINSTRUCTIONAL PROGRAM FOR JUNIOR HIGH SCHOOL STUDENTS.
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THIS PROGRAMED INSTRUCTION TEXT WAS DEVELOPED FOR USE IN AN EXPERIMENTAL STUDY. APPROXIMATELY 600 INSTRUCTIONAL STEPS PRESENT THEORY ON ELECTRIC CIRCUITS, ELECTRONIC COMPONENTS, AND RADIO CIRCUITS. EACH STEP REQUIRES THE COMPLETION OF A STATEMENT WITH AT LEAST ONE WRITTEN ANSWER. THE LABORATORY EXERCISES WHICH ACCOMPANY THIS TEXT HAVE THE ACCESSION NUMBER ED 003 214. (JM)

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ELEMENTARY ELECTRONICS

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ELEMENTARY ELECTRONICS

AN AUTO-INSTRUCTIONAL PROGRAM FOR JUNIOR HIGH SCHOOL STUDENTS

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These materials were prepared for use in an experimental study of the auto-instructional approach in education. Further information concerning the design of the study and the resulting data are contained in reports available from the American Institute for Research.

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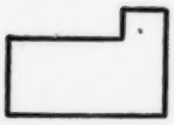
INSTRUCTIONS

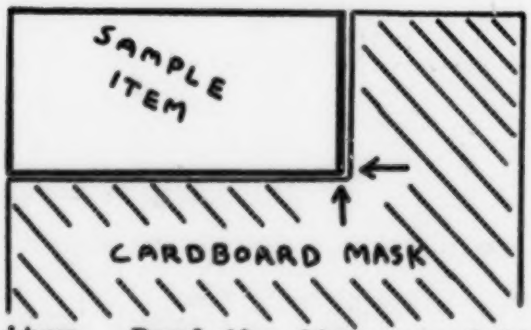
You will be learning about electronics in a new way. These materials are arranged to teach you rapidly and easily if you follow the instructions carefully. As each new principle or fact is explained, you will be given practice using it before you go on to the next principle. This is not a test and you will not be graded on the number of correct answers.

Each step is something like a question. For each item, give the best answer you can. Do not go ahead or skip any question. Each step is important. You are not permitted to go back if you make an error, so try to understand each fact or principle before you go on. Only if it is necessary will you be permitted to go through a unit a second time.

Each step contains one or more blanks that look like this: ____________. Whenever you come to a blank, give the answer you think belongs there. If you read the step carefully, you will find this easy to do. When you have completed the step, you will go on and check your answer with the one given.



Tucked into this booklet you will find a cardboard mask that is shaped like this. Lay the mask on this page so the part that sticks up is on the right hand side and so you can read the printing on the mask. Slide the mask down until the top edge of the mask is directly under the black line at the bottom of the sample item like this:



Now try this sample item. Read the item carefully, and write in the correct word. When you have finished, slide the mask down and uncover the correct answer which is beside the question part of the item.

Physics is the branch of science that deals with the way non-living things act. Electronics is an example of what is studied in ____________.	(You should have written:) physics

Now slide the mask down so the top edge of the mask is lined up with the black line under this item. Be sure the piece of the mask on the right covers the correct answer so you can't see it yet. Sometimes the word you should use is a simple word like the word "not" or "only". Try this item.

Physics does ________ deal with living animals. Physics is concerned ___________ with non-living things.	(You should have written:) not only

This next item has three blanks. Slide the mask down and line up the black lines, then read the item carefully and give your answers.

Some sciences have many branches. Electronics is a __________ of physics, but medicine is ________ a __________ of physics.	branch not branch

When you see a blank with a star in it: *________, it means that two or more words belong there, and all the words must be given. Try the next item after you line up the mask.

Electronics is a branch of physics, but medicine is *____________________________.	not a branch of physics

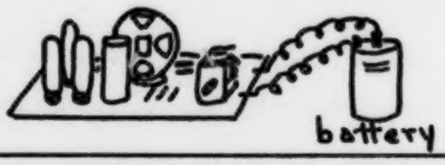
Sometimes it will be necessary to give an answer in your own words. When you see a blank with two stars, like this: **__________, finish the sentence in your own words.

Electronics is a branch of physics, because it deals with non-living things. Medicine is **____.	not a branch of physics because it deals with living things (because it deals with human beings)

Physics uses symbols. A blank like this: #_____, means that a number should be used; a blank like this: $_____, means a symbol, such as a letter or an equal (=) sign belongs there. Words should not be used.

Addition is represented by the symbol +, as in 4 + 7. Two plus two is written 2 $____ 2. Five plus three is written as 5 + #____.	+ 3

Sometimes a step has a figure with it which will help you get the correct answer; study it carefully before filling in the blank.

To operate, a radio needs a supply of electricity. In this radio, electricity is supplied by a ________________. 	battery

You have practiced all the kinds of steps. Remember:

1. This is not a test; it is a way to learn.
2. Try each step, even if you have to guess.
3. Read each step through carefully before you give an answer.
4. Try to use the words a physicist would use.
5. Write each answer out fully; write directly in the book.

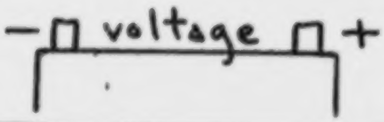
A-1 You are going to learn about electronics. You will understand how a radio works after you have learned about ________________.	electronics
A-2 Electronics has to do with the flow or movement of tiny particles named electrons. The word "electronics" refers to particles called ________________.	electrons
A-3 An electric current is the flow or movement of tiny particles called ________________. In learning about electronics, we have to begin by studying an ______________ current.	electrons electric
A-4 An electric current is a flow of tiny particles called ________________. Thus, whenever electrons move, an electric ________________ exists.	electrons current
A-5 The flow or movement of ________________ is called an * ______________ ___________.	electrons electric current

SKIP THIS PAGE. READ ONLY THE RIGHT HAND PAGES.

A-6 There are two kinds of electrical charges; positive and ____________________.	negative
A-7 All charged objects can be described as having either a __________________ charge, or a * ______________________________.	positive negative charge
A-8 Only negative charges can flow as an electric ______________. Thus, electrons are ________________ charges.	current negative
A-9 An electron is a ________________ charge. An electric current, therefore, is a flow of * ______________________________.	negative negative charges
A-10 An electric current flows along a wire. Another way of saying this is that ________________ charges ______________ along a wire.	negative flow

A-71 A voltage is a * ________________________ of two terminals. In a battery, one terminal has a ______________ charge, the other terminal ** __________________________.	difference of charge negative has a positive charge
A-72 Between the terminals of a "live" battery there is a ____________. If a wire connects the two terminals, an ** _____________________.	voltage electric current will flow
A-73 A voltage is a ** ________________________ ____________________________________.	difference in charge between two terminals
END OF UNIT	

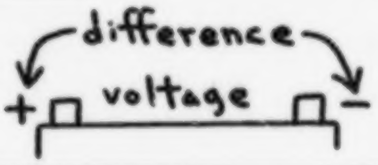
A-11 Positive charges cannot flow along a wire; only negative charges can * ____________ as an electric ________.	flow along a wire current
A-12 Electrons are ________ charges. An electric current is a flow of * ________ ______________.	negative negative charges (negatively charged electrons) (negative electrons)
A-13 An electric current is a ** ____________ ______________________.	flow of (negatively charged) electrons (flow of negative charges)
A-14 Any substance along which current can flow is called a conductor. A copper wire is an example of a ____________.	conductor
A-15 A substance that will conduct current is called a ____________. A copper wire is an example of a ____________.	conductor conductor

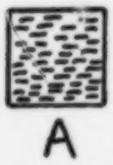
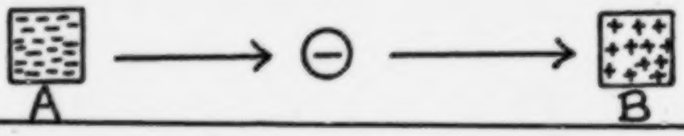
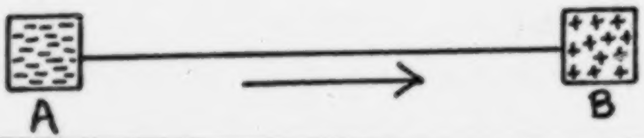
A-66 There must be a ______________ before an electric current will __________ along a conductor.	voltage flow (move)
A-67 If there is no conductor joining them, current __________ flow between two terminals. There can still be a _____________ between the terminals, however.	cannot voltage
A-68 Voltage is a _____________ in the charge at two terminals. Voltage can exist even if the terminals are not joined by a ____________. 	difference conductor
A-69 The greater the difference in charge of the two terminals, the greater the voltage. A large difference means a high ____________, and a small difference means a *__________________.	voltage low voltage
A-70 A high voltage can produce greater current than a ___________ voltage. Amount of current depends partly on the amount of ____________.	low voltage

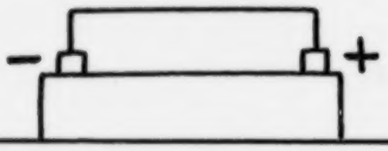
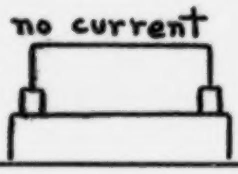
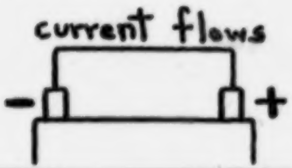
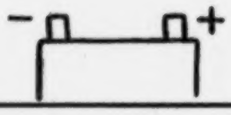
A-16 A conductor is a substance along which an * ______________________ will ______.	electric current flow
A-17 A conductor is ** ______________________ ______________________________.	a substance along which an electric current can flow (substance that will conduct an electric current)
A-18 Current can flow easily along a __________, but not through an insulator. Copper wire is a ______________, but rubber is an ______________.	conductor (wire) conductor insulator
A-19 If you touch a copper wire that is covered with rubber you will not get a shock because the rubber is an ______________.	insulator
A-20 A flow or movement of ______________ charges called ____________ is an * ______________________.	negative electrons electric current

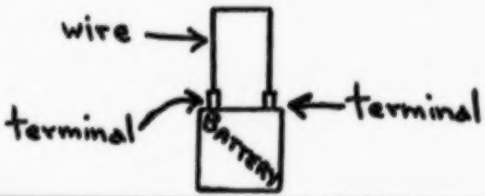
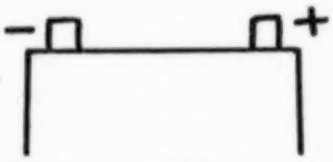
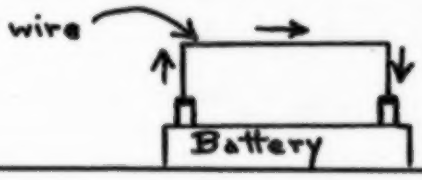
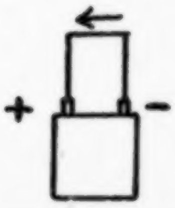
A-61 If there is a __________ between two terminals, and a conductor is connected to both terminals, an * ______________ will flow.	voltage (difference of charge) electric current
A-62 When one terminal is __________ charged and the other is * ______________, there is a __________ between the terminals.	negatively (positively) positively charged (negatively charged) voltage
A-63 Because an electron has a __________ charge, it will be __________ by the cathode and will be * ______________.	negative repelled attracted by the positive terminal
A-64 A difference in charge causes electrons to move along a conductor. Another way of saying this is that a __________ is necessary to produce an electric __________.	voltage current
A-65 Voltage is an electrical "pressure" that causes an * ______________ to move along a conductor. The greater the difference in charge, the __________ is the "pressure" or __________.	electric current greater voltage (electrical pressure)

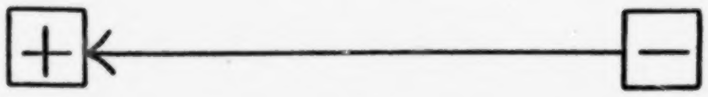
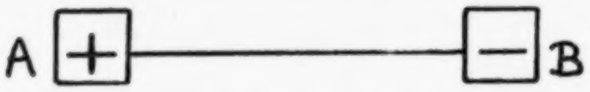
A-21 The difference between conductors and insulators is that in a conductor ** ______________________, but in an insulator ** ______________________.	current will flow (move) current will not flow (move)
A-22 Electrons repel, or move away from, each other. Electrons ____________ all other electrons so they ____________ away from each other.	repel move
A-23 Negative charges ______________ other negative charges, and in similar fashion, positive charges ______________ other positive ________. ←⊖ ⊖→ ←⊕ ⊕→	repel repel charges
A-24 Charges of the same kind repel each other. Because two negative charges are * ____________ ____________________ charges, they * _______ ____________________. ←⊖ ⊖→	the same kind of repel each other
A-25 Two negative charges are alike; they will ______________ each other. Two positive charges will also * ________________________.	repel repel each other

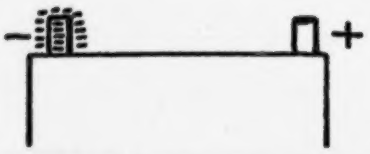
A-56 When a battery is "dead" there is no __________ in the charge at the two terminals. Therefore you know that ** __________________________.	difference current cannot (will not) flow
A-57 When one terminal has a greater concentration of negative charges than the other terminal, there is a ______________ in charge between the terminals and __________________ can flow.	difference current
A-58 Voltage is a word that means that there is a difference in charge between two terminals. When there is a difference in charge, there is a ______________. 	voltage
A-59 A difference in charge is called a __________. A flow of negative charges along a conductor is called an * ____________________.	voltage electric current
A-60 A voltage is a ______________ in charge. There is no voltage between two terminals unless there is a * ________________________.	difference difference in charge (of the terminals)

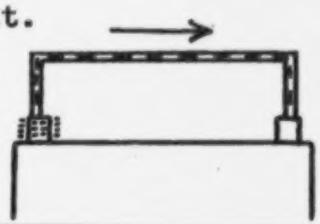
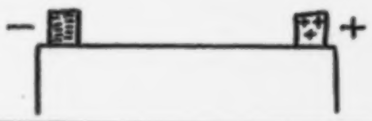
A-26 A positive charge and a negative charge do not repel each other; they attract each other. Two opposite charges always ________________ each other. $\oplus \rightarrow \leftarrow \ominus$	attract
A-27 The general rule of attraction and repulsion is that charges that are alike _____________ each other, and ** ______________________________________ .	repel opposite charges attract (each other)
A-28 Object A has a large concentration of negative charges. Each of the electrons will __________ the other ____________________.  	repel electrons
A-29 Object A has a large negative charge, and object B has a large positive charge. An electron would be _______________ by A and would be * _________________________________.  	repelled attracted by B
A-30 If a wire connects A and B, some of the electrons can flow from A to B; that is, an electric ________________ will _____________ from A to B.  	current flow

A-51 Current can flow along a conductor from the ________________ to the ________________ terminal only if there is a difference in charge between the two ________________. 	cathode positive terminals
A-52 When there is a difference in charge of two terminals, current can flow. If there is no ________________ in charge, ** ________________ ________________.  	difference current cannot flow
A-53 The cathode of a battery has a large concentration of * ________________. Compared with the positive terminal, the cathode has a much larger * ________________.	negative charges (electrons) (concentration of) negative charge
A-54 The cathode of a battery has a greater concentration of * ________________ than the positive terminal; that is, there is a ________________ in charge between the two terminals. 	negative charges difference
A-55 When a battery is dead, there is no ________________ in the concentration of negative charges at the two terminals.	difference

A-31 Every battery has two posts which are called terminals. In this drawing a long copper wire has been connected to the two ________ of the battery.  	terminals
A-32 A battery has two ________. One of them is the positive ________, the other is the * ________.  	terminals terminal negative terminal
A-33 Electrons always flow from the negative terminal of a battery to the * ________. That is, ________ charges come from the ________ terminal.  	positive terminal negative negative
A-34 The negative terminal of a battery is called the cathode. The place electrons come from is always called a ________.	cathode
A-35 Negative charges come from the ________ of a battery. They will flow to the ________ terminal if the terminals are connected by a ________.  	cathode positive conductor

A-46 Current always flows away from the ________ and toward * ______________________________. 	cathode the positive terminal
A-47 Electrons are ______________ by the cathode and are ______________ by the positive terminal. For this reason current always flows ** ____ ____________________________________.	repelled attracted from the cathode to the positive terminal (negative to positive)
A-48 Positive charges do not __________ as an electric current. Electric current consists only of a flow of * ____________________ ________________.	flow (move) negatively charged electrons (negative charges)
A-49 You can tell from this drawing that current flows from terminal $_____ to terminal $_____. This is so because ** ______________________________ ____. 	B A current always flows from the cathode (negative terminal) to the positive terminal
A-50 There is a great concentration of negative charges at the ____________ of a battery, and relatively few at the ______________ terminal of a battery.	cathode (negative terminal) positive

A-36 Current can only __________ along a conductor. Current __________ to the positive terminal of a battery and comes from the __________.	flow (move, travel) flows (moves, travels) cathode
A-37 A cathode is a source of * __________ which make up an electric __________.	negative charges (electrons) current
A-38 Negative charges always move from the cathode, or __________ terminal, along a conductor to the * __________.	negative positive terminal
A-39 Negative charges always move from the ** __________ __________.	cathode (negative terminal) to the positive terminal
A-40 The cathode is the __________ terminal of a battery. Since the cathode has a __________ charge, electrons in the cathode will __________ each other. 	negative negative repel

A-41 A battery has a concentration of negative charges at the cathode. Therefore, you know that electrons will move away ____________ the ______________ if a conductor is attached to it.	from cathode
A-42 Chemical action in a battery causes a concentration of _______________ charged ________ at the ____________.	negatively electrons cathode
A-43 When a conductor connects the two terminals of a battery, the concentration of electrons at the ______________ pushes or __________ electrons away from it. 	cathode (negative terminal) repels
A-44 Compared to the cathode, there are very ______ electrons at the other terminal, that is, at the ________________ terminal of a battery. 	few positive
A-45 Electrons are repelled away from the ________ and are ______________ toward the ________________ terminal.	cathode attracted positive

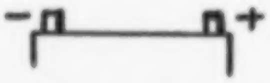
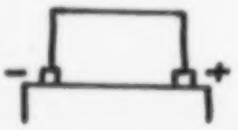
Now turn the book around so the items on the opposite page are right side up. Then begin with Item number 41 and continue on the right hand pages until you reach the end of this unit.

UNIT B

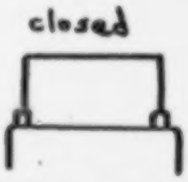
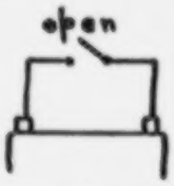
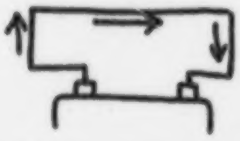
ELECTRIC CIRCUITS

Unit B begins on the next page. Use the cardboard mask as you have done before. Read only the right hand pages.

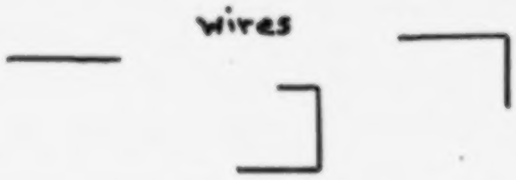
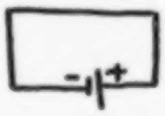
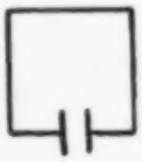
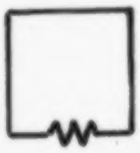
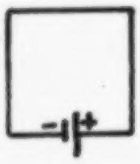
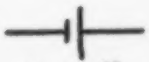
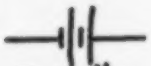
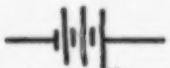
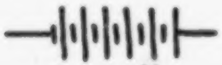
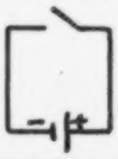
You have now finished this unit. Turn the book around and go on to the next unit.

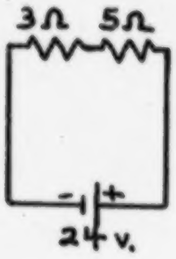
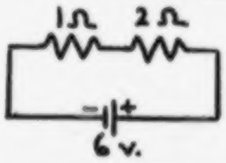
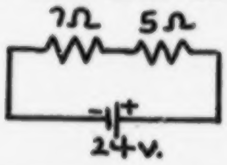
B-1 An electric current is the flow of __________ charges which are called __________.	negative (electrical) electrons
B-2 Current can move easily along a __________, but not along an insulator. Copper wire is a __________, rubber is an __________.	conductor conductor insulator
B-3 A voltage is a * __________ at two terminals. Current will flow from the __________ of a battery to the * __________. 	difference of charge (in concentration of charge) cathode (negative terminal) positive terminal
B-4 In the figure, a voltage exists between the battery terminals. If a conductor connects the terminals, a __________ will flow because of the __________ between the terminals. 	current voltage (battery)
B-5 If two points having a __________ between them are connected with a wire or other __________, there will be a flow of * __________.	voltage (difference in charge) conductor electric current

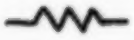
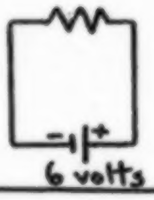
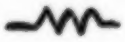
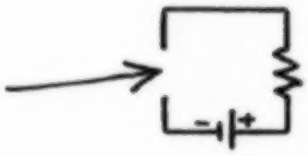
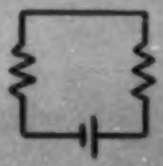
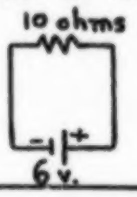
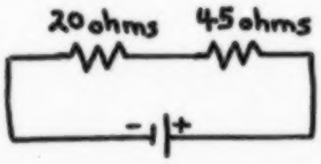
SKIP THIS PAGE. READ ONLY THE RIGHT HAND PAGES.

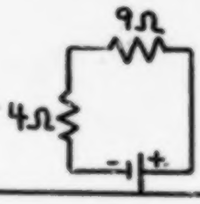
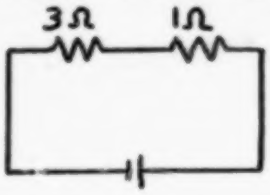
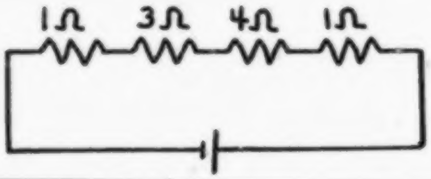
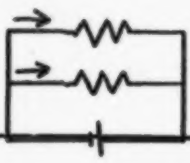
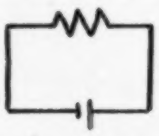
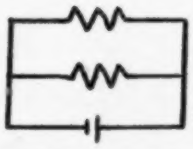
B-6 A complete closed path through which current flows is called a closed circuit. Current will not flow if a ______________ is open.   	circuit
B-7 A closed path through which __________ can flow is called a __________ circuit. 	current closed
B-8 Current can __________ through a closed circuit, but if the circuit is open, then ** ______________________________.	flow current cannot flow
B-9 A drawing of a circuit is called a circuit diagram. This is a circuit ____________ which shows a ____________ circuit. 	diagram closed
B-10 A circuit ____________ is a drawing in which symbols represent the parts of the __________. A plain line represents a wire, or other ______________.	diagram circuit conductor

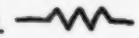
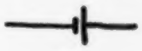
B-71 Resistance means ** ______________________ ______________________.	opposition to current flow (the tendency of a conductor to resist or oppose current flow)
END OF UNIT	

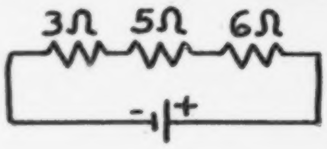
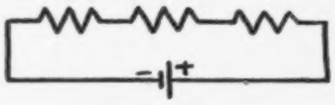
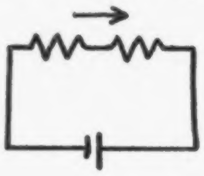
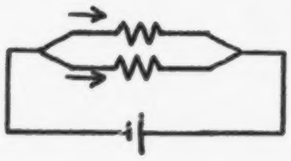
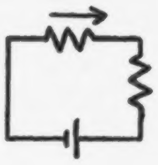
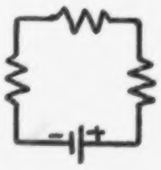
B-11 A line is the symbol for a wire or other ________________. The line may be bent or _____________ .  	conductor straight
B-12 The symbol for battery is —┤├— . In this diagram a ________________ connects the two terminals of a ________________. 	conductor (wire) battery
B-13 The symbol for a battery is —┤├— . The only one of the circuits that contains a battery is circuit $_____. A  B  C 	C
B-14 Batteries consist of cells. As shown, the symbol often represents the number of cells in the ________________, but the symbol —┤├— can be used to represent any ________________.  1 cell  2 cells  3 cells  6 cells	battery battery (any number of cells)
B-15 The symbol —\— represents a switch that is open, breaking the circuit so that __________ cannot flow. This circuit contains one open ______________ and one ________________. 	current switch battery (cell)

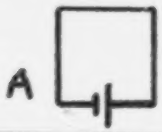
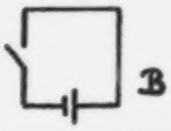
B-66 $I = \frac{V}{R}$. In a series circuit, R is the sum of all of the ** ______________________________.	resistances in the circuit
B-67 In this circuit, total R = # _____ ohms and I = # _____ amps. Total $R = R_1 + R_2$ 	8 3
B-68 Although these two circuits each contain different total amounts of ______________, and contain batteries with different ______________, the amount of current in both circuits is # ___ amps.  	resistance voltages 2
B-69 Amps is an abbreviation for ______________, which are a measure of amount of ______________.	amperes current
B-70 Current is measured in ____________. The statement "a current of 100 volts" is incorrect because ** ______________________________.	amperes (amps) current is measured in amperes (not in volts)

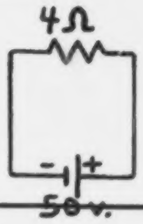
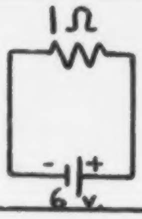
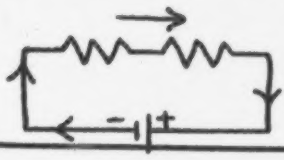
B-21 The tendency for substances to resist or oppose the flow of current is called electrical ____________________. Even good conductors have some ____________________.	resistance resistance
B-22 The symbol for resistance is . This circuit consists of a 6 volt ________________ to supply the current, plus something that has electrical ____________________.  	battery resistance
B-23 The symbol for resistance is . On this circuit draw in a second resistance where the arrow indicates you are go do so. Put a second resistance here: 	
B-24 Voltage is measured in ____________, abbreviated v. Resistance is measured in ohms. In this circuit there is a 6 ______________ battery and something which has a resistance of 10 ____________.  	volts volts ohms
B-25 In this circuit there are conductors, a battery, something having a resistance of 20 __________, and ** ____.  	ohms something having a resistance of 45 ohms

B-61 Total resistance is the sum of resistances connected in series. In this circuit total R is the __________ of 4 ohms plus #_____ ohms. Total R = $R_1 + R_2$ 	sum 9
B-62 In a series circuit the total resistance is the ___________ of all the ________________ in the circuit. In this circuit total R = #___ ohms.  Total R = $R_1 + R_2$	sum (total) resistances 4
B-63 To find the total resistance in a series circuit, you simply ** ____________________________________. In this circuit total R = #_____ ohms. 	add up all the resistances 9
B-64 A series circuit has only * ___________________ for the current. This circuit has two different paths for the current, so it is not a * ________________________________. 	one path series circuit
B-65 There is only one path for current through a series circuit. Circuit $_____ is a series circuit because there is only * _________________ for the current. A B	A one path

B-26 All substances, including conductors, tend to resist the flow of current. A resistance of 2000 __________ opposes the flow of current __________ than a resistance of 10 ________.	ohms more ohms
B-27 Resistance is measured in __________. The symbol  represents __________ ______, and the symbol  represents a ________________.	ohms resistance battery
B-28 The filament of light bulb opposes or resists the * ________________________ _. All conductors have resistance, which means that they ** ______________________________________.	flow of current oppose (resist) the flow of current
B-29 Resistance means the extent to which a conductor ** ______________________________.	opposes (resists) (the flow of) current
B-30 Even a good ____________, such as a copper wire, had some resistance, which means that it ** __________________________________.	conductor resists (opposes) the flow of current

B-56 Resistances connected one after another are said to be in series. In this circuit, three resistances are connected in ______________. 	series
B-57 Three resistances are connected in __________ in this circuit, and therefore this circuit is called a ____________ circuit. 	series series
B-58 Circuit A is a ___________ circuit and so is circuit $_____, because the current passes through the resistances one after another. 	series C
B-59 This circuit is a * ______________________ because the resistances are connected in ______________. 	series circuit series
B-60 In a series circuit each resistance adds some opposition to the flow of ___________. The total resistance in a series circuit is the sum of all _________________.	current resistances

B-16 Figure A is a complete or closed ______________; current will ___________ through it. Figure B is an * ___________________________; therefore, ** ____. A   B	circuit flow (move) open circuit current will not flow through it
B-17 Voltage is measured in volts. The amount of voltage in private homes is about 120 _________. Most automobile batteries produce 12 _________.	volts volts
B-18 Between the terminals of most automobile batteries there is a voltage of 12 __________. If a wire is connected between the terminals of a battery, an * ______________________________ will flow.	volts electric current
B-19 If a light bulb is connected to a battery, the bulb will produce both heat and _____________ as the * ________________________________ flows through the bulb. 	light electric current
B-20 A light bulb has electrical resistance. All devices such as motors, bulbs, and electric heaters that use current have electrical ______________________.	resistance

B-51 The formula for current is written $________. The formula shows that if V increases, I ____________, but if R increases, then I ____________.	$I = \frac{V}{R}$ increases decreases
B-52 If V increases I increases. If R increases, then *______________. You already knew this, since higher voltage __________ current while higher resistance *____________ ________ _____.	I decreases increases reduces (decreases) current
B-53 The formula for current is I = $______. In this circuit, R is 4 ohms and V is 50 volts, and the current is #________ amps. 	$\frac{V}{R}$ 12.5 (12-1/2)
B-54 Current is calculated from the formula: *________ ________ ____________________. The current in this circuit is *______________. 	voltage divided by resistance (volts divided by ohms) ($I = \frac{V}{R}$) 6 amps
B-55 There are two resistances in this circuit. The current flows from the ______________ of the battery, through both ________________, one after another, and back to the ______________. 	cathode resistances battery (positive terminal)

B-31 Voltage "pushes" electric current along a conductor, but the ________________ of the conductor opposes or resists the __________ of current.	resistance flow
B-32 Very thin conductors have more resistance than thicker conductors. The filament in a light bulb is very thin; it has * __________________________ than a thick copper wire.	more (greater) resistance
B-33 The filament of a light bulb gets very hot because it is very thin and has a __________ amount of ____________________.	large resistance
B-34 Generally, thinner wires have * ____________ ________________ than thicker wires. The greater the amount of __________________, the smaller the amount of ________________ that can flow.	more resistance resistance current
B-35 The amount of current that will flow along a conductor depends on two things: the voltage and the ______________ of the conductor.	resistance

B-46 The relationship between volts, ohms, and amperes is shown in circuits A and B. The amount of current in circuit C is #_____ amps.

	Circuit A	Circuit B	Circuit C
Volts	20	24	12
Ohms	10	6	4
Amps	2	4	?

3

B-47 The amount of current is equal to the voltage divided by the resistance. That is, number of amperes equals number of ____________ divided by number of __________.

Current = $\frac{\text{voltage}}{\text{resistance}}$ amperes = $\frac{?}{?}$

volts
ohms

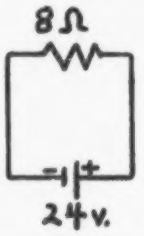
B-48 The formula, Current = $\frac{\text{Voltage}}{\text{Resistance}}$, can be abbreviated $I = \frac{V}{R}$. V stands for _________ ____, and R for ________________. The abbreviation for current, however, is $____, not C.

voltage
resistance
I

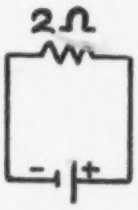
B-49 The letter I stands for _____________ in the formula: current equals voltage divided by resistance. The formula is written I = $_____.

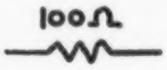
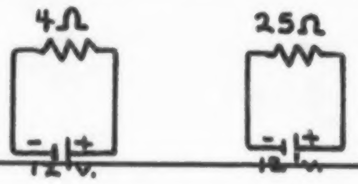
current
$\frac{V}{R}$

B-50 The voltage in this circuit is #_____ volts; the resistance is 8 _________; and the current is #______ amps.



24
ohms
3

B-36 Voltage is like a pressure which "pushes" electric current along a conductor. The greater the voltage, the * ______________ ______________.	greater (larger, stronger) the current
B-37 The higher the voltage, the ____________ the current, but the greater the resistance, the ______________ the current.	higher (greater, larger) smaller (lower)
B-38 Amount of current in a circuit is measured in amperes. Amp is an abbreviation for _________.	amperes
B-39 Amount of current is measured in ____________, while the electrical pressure which produces the current in a circuit is measured in __________.	amperes volts
B-40 In this ___________ diagram, the symbol, Ω, means ohms, which is a measure of the amount of _________________, or opposition, to the flow of current. 	circuit resistance

B-41 The symbol Ω stands for ____________, and the symbol —\/\/\/— represents ______________. Resistance is measured in ____________. 	ohms resistance ohms
B-42 As the voltage is increased in a circuit, the current ______________. High voltages can produce * __________________________ than lower voltages.	increases larger currents (more current) (more amperes of current)
B-43 Increasing the voltage increases the ________; but increasing the resistance * ______________________________________.	current reduces (decreases) the current
B-44 Increasing resistance reduces the amount of current. The circuit on the right has the ________________ resistance and therefore allows ____________ current to flow than in the circuit on the left. 	greater (larger) less
B-45 Voltage is measured in ____________, resistance in ____________, and current in ____________.	volts ohms amperes

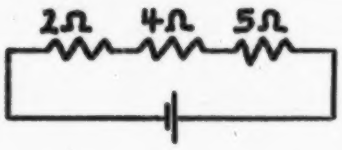
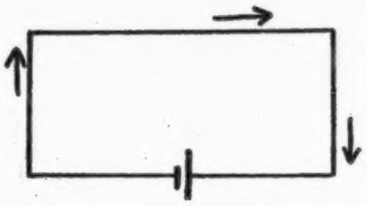
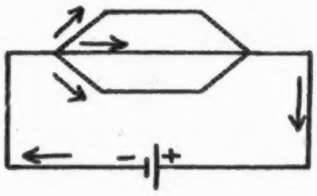
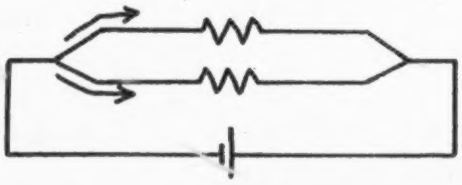
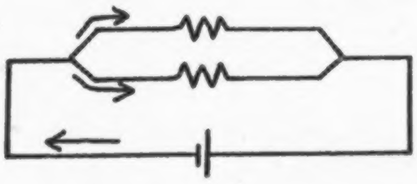
Now turn the book around so the items on the opposite page are right side up. Then begin with Item number 41 and continue on the right hand pages until you reach the end of this unit.

UNIT C

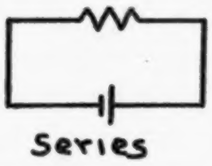
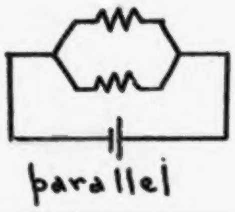
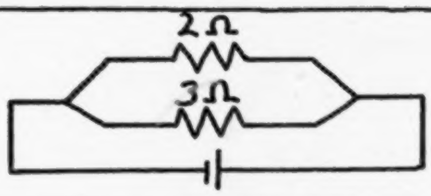
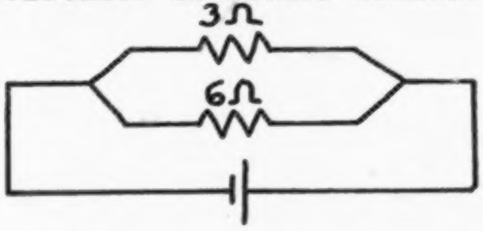
SERIES AND PARALLEL CIRCUITS

Unit C begins on the next page. Use the cardboard mask as you have done before. Read only the right hand pages.

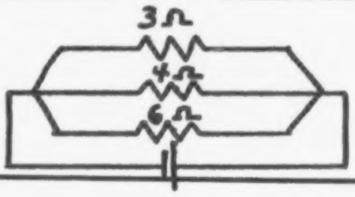
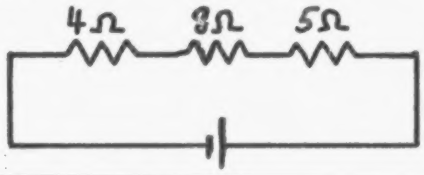
You have now finished this unit. Turn the book around and go on to the next unit.

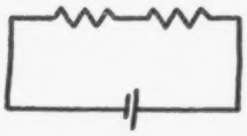
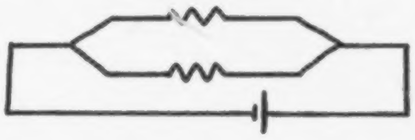
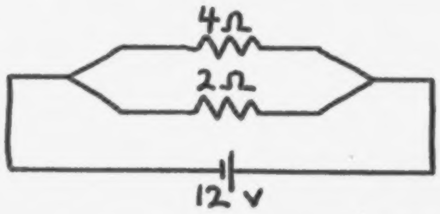
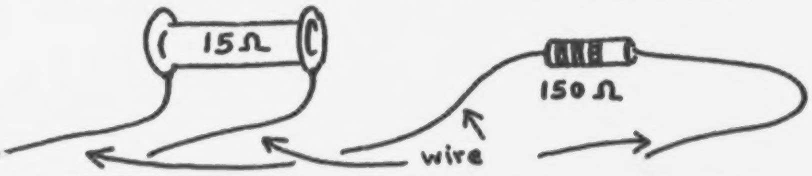
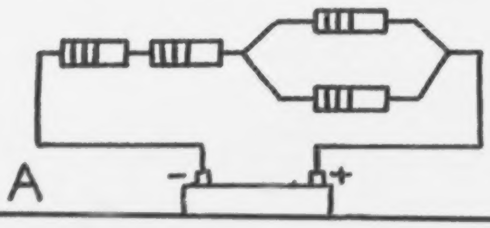
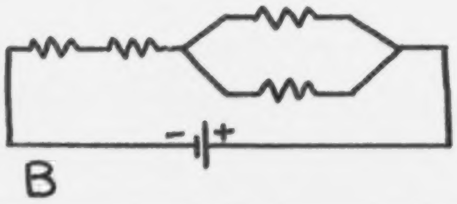
C-1 In a series circuit, $R = R_1 + R_2 + R_3$, that is, total resistance equals the __________ _____ of all the resistances. In this ________________ circuit, total R = #_______ ohms.  R = 2 + 4 + 5	sum (total) series 11
C-2 As shown below, in a series circuit there is only _______________ path for the current. 	one
C-3 In this circuit, the current splits into #______ paths. This is _________ a series circuit; it is a parallel circuit. total current = 6 amps  	3 not
C-4 If a circuit has more than one path for the current, it is called a parallel circuit. This is a ____________________ circuit. 	parallel
C-5 Since there are #______ paths for the ___________ in this circuit, it is a ________________ circuit. 	2 current parallel

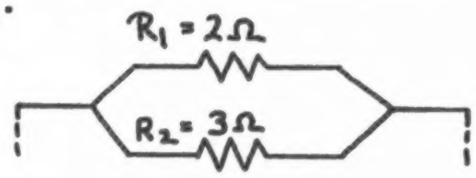
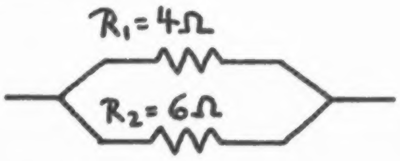
C-76 Resistance is opposition to the flow of * __________________________. Resistance is measured in __________.	electric current (negative charges) ohms
END OF UNIT	

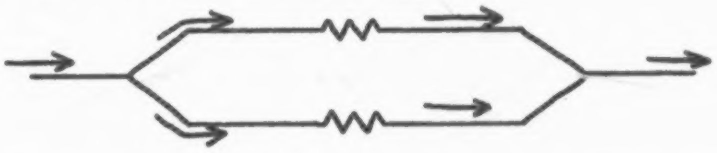
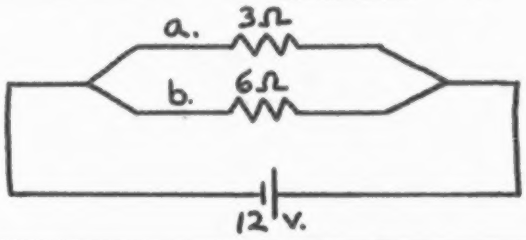
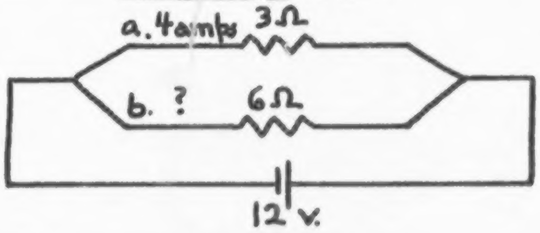
C-6 In a series circuit there is only ________ path for the current, but in a parallel circuit there is * ________________________ path for the current.   	one more than one
C-7 The current splits into branches in a ________ circuit. In this circuit, part of the current flows through the 2 ohm resistance and part ** ______________________________________.  	parallel flows through the 3 ohm resistance
C-8 In a parallel circuit, there are several branches. Only part of the ______________ flows through each ________________.	current branch (path) (resistance)
C-9 In a series circuit all the current follows one path, but in a parallel circuit ** ____________ ____.	only part of current goes through each branch (the current splits) (there are several branches for the current)
C-10 In this _________________ circuit, the total resistance is only 2 Ω , which is __________ than the resistance in either branch.  	parallel less

C-71 In a series circuit, total resistance is found by ** ______________________________.	adding the resistances in the circuit
C-72 In a parallel circuit, $1/R_T$ is found by the formula, $ ____________________. To find total resistance, turn $1/R_T$ * ______________ and then ______________.	$1/R_T = 1/R_1 + 1/R_2$ upside down (over) divide
C-73 In both series and parallel circuits, current is determined by the formula $ ________.	$I = \frac{V}{R}$
C-74 Voltage is a ______________ in charge of two terminals. Voltage is measured in __________.	difference volts
C-75 Electric current is a flow or movement of * ________________________. Current is measured in ______________.	negative charges (electrons) amperes

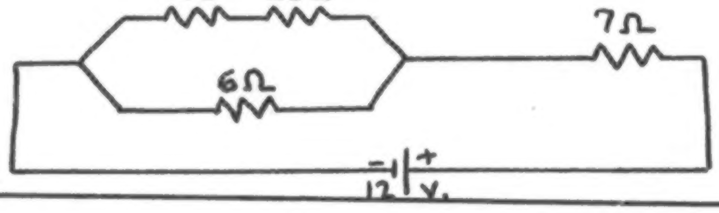
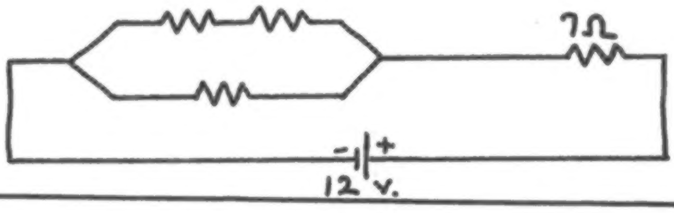
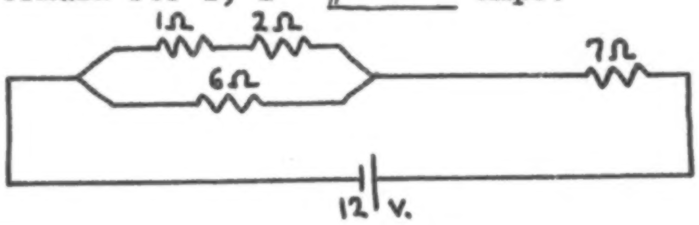
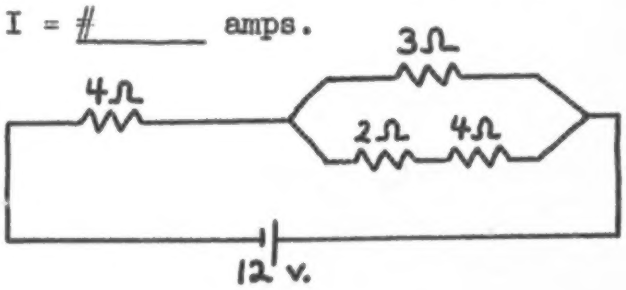
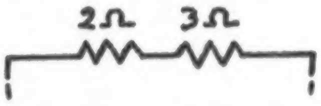
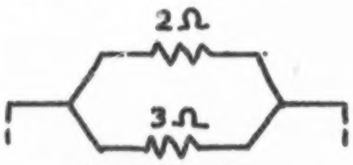
C-11 Total resistance in a parallel circuit is always ____________ than the smallest resistance in the circuit. In this circuit, total resistance must be ____________ than # ______ ohms.  	less less 3
C-12 In any parallel circuit, the total resistance is always ____________ than the ________________ resistance in the circuit.	less smallest
C-13 This is a ______________ circuit. Total resistance is # _____ ohms. In a series circuit, total resistance is always ____________ than any resistance in the circuit.  	series 17 more (greater)
C-14 In a series circuit, total resistance = $R_1 + R_2$. The symbol R_T stands for total resistance, so the formula can be written $ ______ = $R_1 + R_2$.	R_T
C-15 The symbol for total resistance is $ ______. In a series circuit $ ______ is the ________ of ** ______ ______________________________.	R_T R_T sum all the resistances in the circuit

C-66 The current in a series circuit is * ________ ________ everywhere in the circuit, but the current is divided in each branch of a ________ circuit.  	the same parallel
C-67 In a parallel circuit, only ____________ of the current flows through each branch. The total current is the ____________ of the current in all the branches.	part sum
C-68 In this circuit, 3 amps of current flow through the 4Ω resistance, and 6 amps through the 2Ω resistance. The total current is #_____ amps. 	9
C-69 A resistor is any resistance added to a circuit specifically to provide opposition to current flow. Sketch A represents a 15 ohm ____________, and sketch B a 150 ohm ________________. 	resistor resistor
C-70 This drawing in Figure A shows a circuit with 4 ______________ in it. Figure B is a circuit ______________ of the same circuit.  	resistors diagram

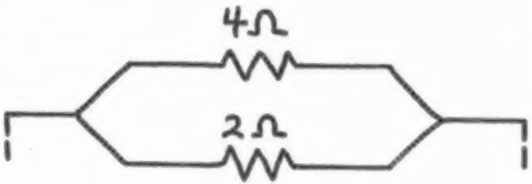
C-16 In a parallel circuit R_T must be determined in a special way; that is, you do __________ simply add resistances as you would for a __________ circuit.	not series
C-17 The formula for finding R_T in a parallel circuit is $1/R_T = 1/R_1 + 1/R_2$. In this circuit, $R_1 = 2$, so $1/R_1 = 1/2$. Similarly, R_2 = #________, so $1/R_2$ = #________.  	3 1/3
C-18 If $R_1 = 3$, $1/R_1 = 1/3$. If $R_2 = 5$, $1/R_2$ = #_____. If $R_3 = 2$, $1/R_3$ = #________.	1/5 1/2
C-19 To find R_T in a parallel circuit, first change each R to 1/R. In this circuit, $1/R_1$ = #_____ and $1/R_2$ = #_______.  	1/4 1/6
C-20 The formula for finding total resistance in a parallel circuit is $1/R_T = 1/R_1 + 1/R_2$. If $R_1 = 2$ and $R_2 = 3$, then $1/R_T$ = #________ + #________.	1/2 1/3

C-61 When current passes through a series circuit, it can take only _________ path, so the same amount of current passes through _________ parts of the circuit.	one all (every)
C-62 The amount of current is not the same everywhere in a _____________ circuit. The current divides so only _________ of the total current goes through each _____________. 	parallel part (some) branch (resistance)
C-63 The current in each branch of this parallel circuit is $I = \frac{V}{R}$. In branch a, I equals #_____ divided by #______, or #________ amps. 	12 3 4
C-64 The current in branch a is 4 amps. The current in branch b is 12 volts divided by #______ ohms which is equal to #_______ amps. 	6 2
C-65 The basic formula $I = \frac{V}{R}$ can be used to determine the current through any circuit. The current is the same in all parts of a __________ circuit.	series

C-21 To find $1/R_T$, we have to add fractions. When $1/R_T = 1/2 + 1/3$, we have to find the _______ of #_______ and #______.	sum (total) 1/2 1/3
C-22 To add fractions, we have to make the denominators the same. The fractions 1/3 and 1/2 do __________ have the same denominator, but 2/6 and 3/6 have the ______________ denominator.	not same
C-23 To add 1/2 and 1/3, we have to change 1/2 to 3/6 and change 1/3 to 2/6. 1/2 is the same as 3/6 and *________________________________.	1/3 is the same as 2/6
C-24 To add 1/5 and 1/2, we have to have the ________ denominator. We have to change 1/5 to #______ and change 1/2 to #________.	same 2/10 5/10
C-25 1/2 and 1/3 must be changed to #______ and 2/6 in order to be added. 3/6 + 2/6 = #__________.	3/6 5/6

C-56 In the parallel portion of the circuit, R_1 = #______ ohms and R_2 = #______ ohms. $1/R_T$ = #______ and after dividing, R_T = #______ ohms.  	3 6 3/6 2
C-57 In the parallel portion of the circuit, R_T = 2 ohms. For the entire circuit, the total resistance is #______ ohms.  	9
C-58 The total resistance in this circuit is 9 ohms and the voltage is #______ volts. Using the formula for I, I = #______ amps.  	12 1.33 (12/9 = 1-1/3)
C-59 Find the current in this circuit. Work slowly and carefully. I = #______ amps.  	2 $\begin{cases} R_2 = 2 + 4 = 6 \\ 1/R_T = 1/3 + 1/6 = 3/6 \\ R_T = 6/3 = 2 \\ \text{total } R = 2 + 4 = 6 \text{ ohms} \\ I = \frac{V}{R} = 12/6 = 2 \text{ amps} \end{cases}$
C-60 Circuit A is a ______________ circuit, circuit B is a parallel circuit. In circuit B the resistances are connected in ____________ with each other.  Circuit A  Circuit B	series parallel

C-26 1/4 + 1/2 is the same as 1/4 + 2/4. The sum of 1/4 + 2/4 = #______. In this circuit $1/R_T$ = #______.



3/4
3/4

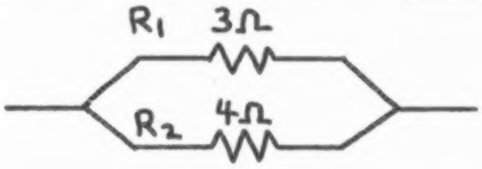
C-27 $1/R_T = 1/R_1 + 1/R_2$. When $R_1 = 2$ and $R_2 = 3$, then $1/R_T$ = #______ + #______. Adding, $1/R_T$ = #______________.

1/2
1/3
3/6 + 2/6 (5/6)

C-28 The formula for finding total resistance in a parallel circuit is $1/R_T$ = $______ + $______.

$1/R_1$
$1/R_2$

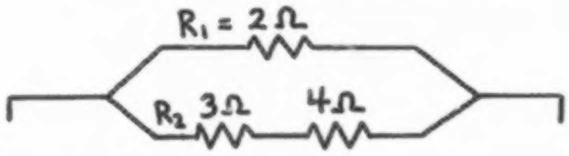
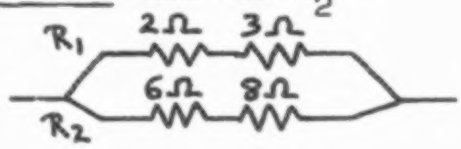
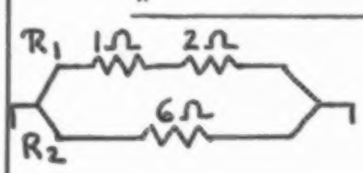
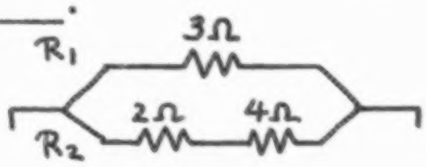
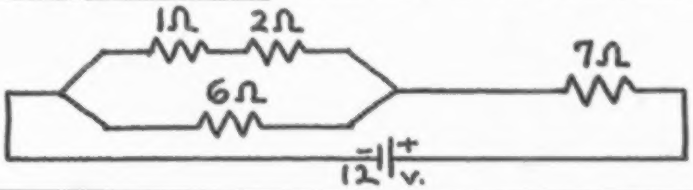
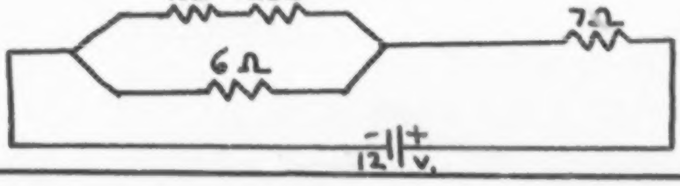
C-29 In this circuit, $1/R_T$ = 1/3 + #_____. To add, we change 1/3 to 4/12 and 1/4 to #______.



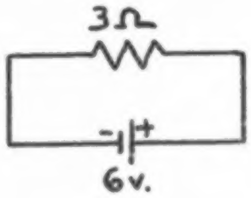
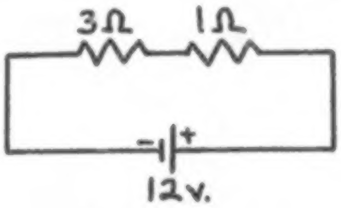
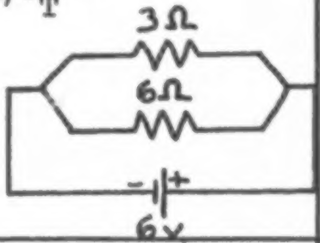
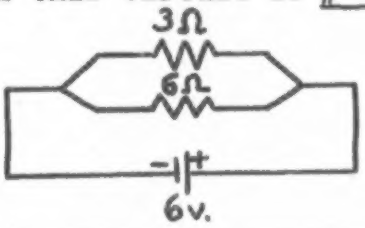
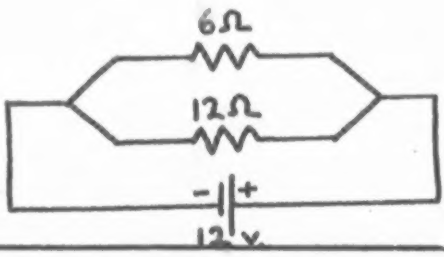
1/4
3/12

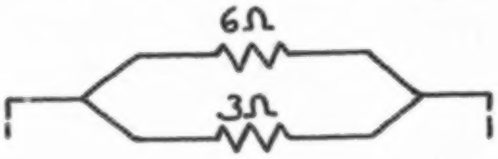
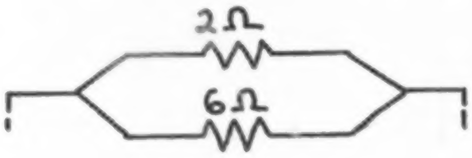
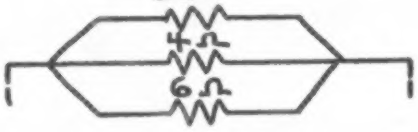
C-30 When $R_1 = 3$ and $R_2 = 4$, $1/R_T = 1/3 + 1/4$, or $1/R_T = 4/12 + 3/12$. Adding, $1/R_T$ = #_____.

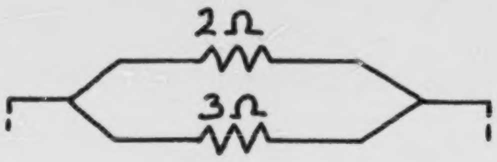
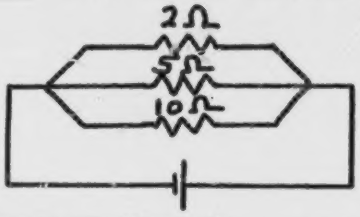
7/12

C-51 In this circuit, R_1 is 2 ohms. R_2 is simply 3 + 4, or 7 ohms, because the 3 and 4 ohm resistances are connected in ______________ with each other.  $R_1 = 2\Omega$ R_2 3Ω 4Ω R_2 = 3 ohms + 4 ohms	series (in "line" means the same thing, but the correct word is "series")
C-52 In order to determine R_T of this parallel circuit, first add up all resistances connected in series in each branch. R_1 = #________ ohms and R_2 = #________ ohms.  R_1 2Ω 3Ω 6Ω 8Ω R_2	5 14
C-53 In both of these diagrams, R_1 is #_____ ohms and R_2 is #________ ohms. The total resistance in each circuit is found by the formula $1/R_T$ = *____________________________.  R_1 1Ω 2Ω 6Ω R_2  R_1 3Ω 2Ω 4Ω R_2	3 6 $1/R_1 + 1/R_2$
C-54 In this circuit the 1 ohm and 2 ohm resistances are connected in _______________. Their total resistance of #_____ ohms is connected in _______________ with the 6 ohm resistor.  1Ω 2Ω 6Ω 7Ω 12 V.	series 3 parallel
C-55 To determine the current flowing through this circuit, you first have to find the total __________________ in the circuit and then use the formula I = $________.  1Ω 2Ω 6Ω 7Ω 12 V.	resistance $\frac{V}{R}$

C-31 When R_1 = 2 and R_2 = 5, $1/R_T$ = 1/2 + 1/5, or $1/R_T$ = #_____ + #_____. Adding, $1/R_T$ = #_______.	5/10 2/10 7/10
C-32 When R_1 = 3 and R_2 = 5, $1/R_T$ = 1/3 + 1/5. To add, change the denominator to 15, so $1/R_T$ = #_____ + #_____. $1/R_T$ = #______.	5/15 3/15 8/15
C-33 After finding $1/R_T$, we have to find R_T. To do this, turn $1/R_T$ upside down. If $1/R_T$ = 5/6, then R_T is 6/5. If $1/R_T$ = 3/4, then R_T = #____.	4/3
C-34 If $1/R_T$ is 7/12, then R_T = 12/7. If $1/R_T$ = 8/15, then R_T = #_____. If $1/R_T$ = 7/10, then R_T = #_____.	15/8 10/7
C-35 If $1/R_T$ = 5/6, R_T = #_____. Now divide 6 by 5 as shown below, and you get #______. $\begin{array}{r} 1.2 \\ 5\,\overline{)\,6.0} \\ \underline{5} \\ 1\;0 \end{array}$	6/5 1.2

C-46 In a series circuit, current is determined by the formula $I = \frac{V}{R}$. In this circuit, I = # _____ amps.  	2
C-47 Current is measured in _________ by the formula I = $ _____. In this circuit, I = # _____.  	amperes (amps) $\frac{V}{R}$ 3 amps
C-48 Current in a parallel circuit is determined exactly as in a series circuit. $I = \frac{V}{R}$. In this circuit, first compute R_T. $1/R_T$ = # _____, and R_T = # _____ ohms.  	3/6 ($1/R_T = 1/3 + 1/6 = 2/6 + 1/6 = 3/6$) 2 ($R = 6/3 = 2$ ohms)
C-49 In this parallel circuit, R_T = 2 ohms, and V = # _____ volts. Using the formula I = $ _____, the current in this circuit is # _____ amps.  	6 $\frac{V}{R}$ 3
C-50 If R_1 = 6 ohms and R_2 = 12 ohms and V = 12 volts in a parallel circuit, then R_T = # _____ ohms, and I = # _____ amps.  	4 ($R_T = 12/3 = 4$ ohms) 3 ($I = \frac{V}{R} = 12/4 =$ 3 amps)

C-36 $R_T = 5/2$. Divide 5 by 2 and get R_T = #______. If $1/R_T = 3/6$, then R_T = #_____, which is equal to #______.	2.5 6/3 2
C-37 In this parallel circuit, $1/R_T$ = #____ + #_____ and $1/R_T$ = #______. After dividing, R_T = #______. 	1/6 1/3 3/6 2.0
C-38 In this circuit, $1/R_T$ = #_____ + #______, $1/R_T$ = #______, and after dividing, R_T = #______. 	1/2 1/6 4/6 1.5
C-39 In this circuit, there are three branches, so $1/R_T = 1/3 + 1/4$ + #_____. Changing the denominator to 12, $1/R_T = 4/12$ + #_____ + #____. 	1/6 3/12 2/12
C-40 $1/R_T = 4/12 + 3/12 + 2/12$ = #_____. To find R_T, turn this figure upside down and divide. R_T = #_____ ohms.	9/12 1.33 (1-3/9) (1-1/3) $1/R_T = 9/12$ $R_T = 12/9$ $\begin{array}{r} 1.33 \\ 9\overline{)12.00} \end{array}$

C-41 In this circuit the resistances are 2 ohms and 3 ohms. $1/R_T$ = #______ + #______. Common denominator is 6, so $1/R_T$ = #______ and R_T = #______. 	1/2 1/3 3/6 + 2/6 (5/6) 1.2 (6/5)
C-42 Determine the resistance in this parallel circuit using the formula $1/R_T = 1/R_1 + 1/R_2 + 1/R_3$. $1/R_T$ = #______ and, after dividing, R_T = #______. 	8/10 1.25
C-43 $1/R_T = 1/R_1 + 1/R_2$. This tells you how to find $1/R_T$. To find R_T you must turn $1/R_T$ * ______ ______, and then ______.	upside down (over) divide
C-44 In a parallel circuit, current flows through ______ than one ______. In a series circuit, there is only ** ______ ______.	more branch (path) one path for the current
C-45 In a series circuit $R_T = R_1$ + $______. In a parallel circuit, $1/R_T$ = $______ + $______.	R_2 $1/R_1$ $1/R_2$

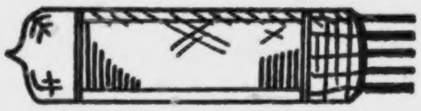
Now turn the book around so the items on the opposite page are right side up. Then begin with Item number 41 and continue on the right hand pages until you reach the end of this unit.

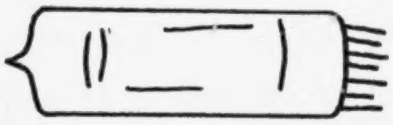
UNIT D

VACUUM TUBES

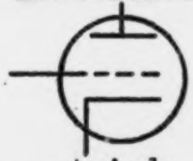
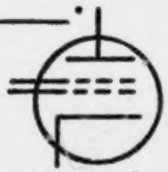
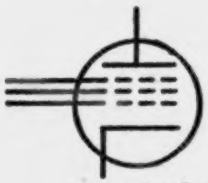
Unit D begins on the next page. Use the cardboard mask as you have done before. Read only the right hand pages.

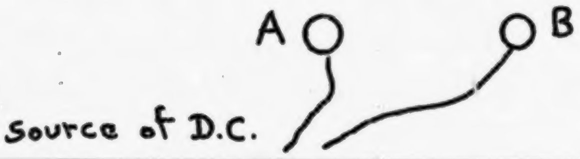
You have now finished this unit. Turn the book around and go on to the next unit.

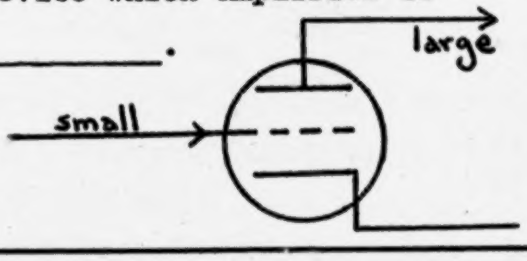
D-1 A glass tube from which most of the air has been removed is called a vacuum tube. Most radios contain several glass * ____________________.	vacuum tubes
D-2 This is a drawing of a * ____________________. It is used to change electric current. Different kinds of * ________________ will change * ____________________ in different ways. 	vacuum tube vacuum tubes electric currents
D-3 Electric currents can be changed in several ways. For example, current can be forced to flow in only one direction by passing it through a * ________________________.	vacuum tube
D-4 Current which moves in only one direction is called direct current. The current from a battery moves only in * ____________________, thus, it is * ____________________.	one direction direct current
D-5 DC is the abbreviation for * ________________ ____________, which is current that moves * ________________________________.	direct current only in one direction

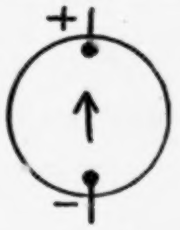
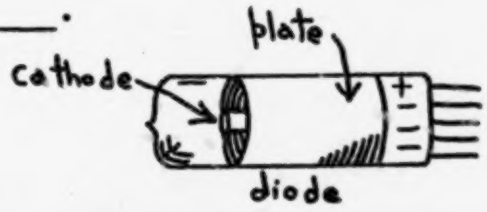
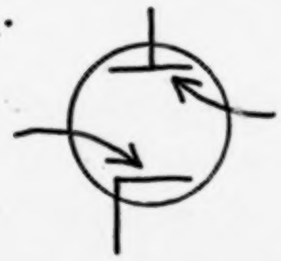
D-76 To change AC to DC you would use a ____________. To increase the size of fluctuations in current, you would use a ____________.	diode (rectifier) triode (amplifier)
D-77 An amplifier magnifies small fluctuations in current. A ____________, which is a tube containing a ____________, is the kind of tube generally used as an ______________.	triode grid amplifier
D-78 Transistors are small blocks of silicon or germanium metal which are often used in place of vacuum tubes. Tiny portable radios often contain ______________.	transistors
D-79 Vacuum tubes have been replaced by __________ in many kinds of electronic equipment. Although vacuum tubes are fairly large, ______________ can be made very ____________.  	transistors transistors small
END OF UNIT	

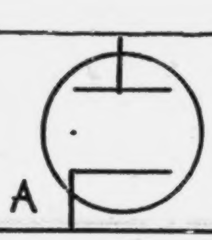
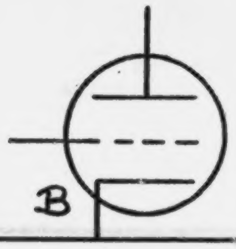
D-6 AC is the abbreviation for alternating current. Direct current moves only in one direction; but *______________________ moves back and forth.	alternating current
D-7 Batteries supply direct current, or $____, but the current in your homes is *______________ ______________. Your wall sockets at home supply $_____.	DC alternating current AC
D-8 AC moves first in one direction in a wire, then in the *____________________; that is, alternately back and forth. DC moves only in *____________________.	other direction (opposite direction) one direction
D-9 DC moves only in *____________________, while AC moves *____________________.	one direction back and forth
D-10 DC flows in only *____________________. If end A of this wire is negative, it will be the source of electrons and DC will flow from *______________.	one direction A to B

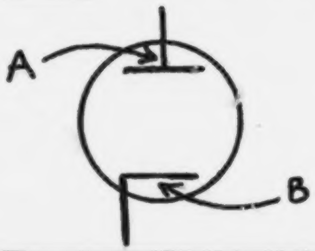
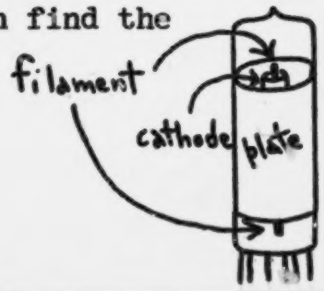
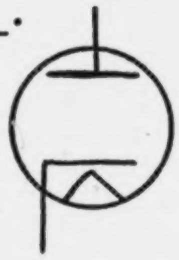
D-71 A triode changes small fluctuations in current into * ______________________. For this reason it is called an ____________.	larger fluctuations amplifier
D-72 A triode is satisfactory for many purposes, but sometimes tubes such as these are used. These tubes differ from triodes in that they contain additional ________.  triode  tetrode  pentode	grids
D-73 A triode is called an ____________, because it is used to ** ______________________ ______________________.	amplifier increase the size of fluctuations in current
D-74 A rectifier is a tube that changes AC to $ ____. A ____________ is the kind of tube generally used as a ______________.	DC diode rectifier
D-75 Because a diode is used to change * __________, it is called a ____________.	AC to DC rectifier

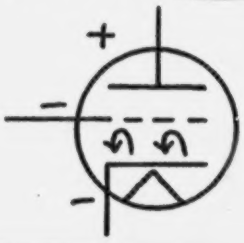
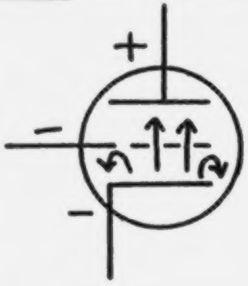
D-11 AC moves * ______________. If A is first made negative, a moment later A will be positive. Current will flow first from A to $ ____ and then from * ______________. 	back and forth B B to A
D-12 If A and B are connected to a DC source, so that A is positive, A will always remain ________ and B will * ______________.  	positive always remain negative
D-13 If A and B are connected to an AC source, so that at one moment A is positive and B is ____________, a moment later B becomes positive and * ______________. A B A.C. Source	negative A becomes negative
D-14 In electronic devices AC often must be changed to DC; that is, instead of moving back and forth, the current must be made to move ** ______________ ______________.	only in one direction
D-15 One kind of vacuum tube, called a diode (die-ode), is able to change AC to DC. Electrons can flow only in one direction through a ____________.	diode

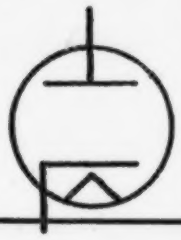
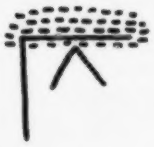
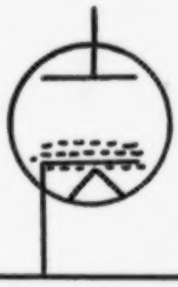
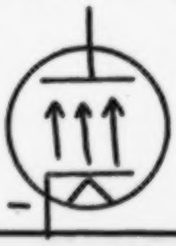
D-66 If the grid is connected to current that is fluctuating, the __________ will sometimes be more negative than it is at other times.	grid
D-67 If the grid is connected to current that is fluctuating, the current flowing through the triode will also ______________.	fluctuate
D-68 Even small fluctuations in the current coming to the grid will produce __________ changes in the ______________ flowing through the triode.	large current
D-69 A triode can be used to change very __________ fluctuations of current coming to the grid into * ______________________________________ of current between the cathode and plate.	small (much) larger fluctuations
D-70 Because a triode can amplify, or increase the size of, fluctuations in current, it is called an amplifier. Any device which amplifies is called an ________________. 	amplifier

D-16 AC can be changed to DC by a ____________, which is like a one-way valve that lets electrons move only ** ______________________________.	diode in one direction
D-17 A diode lets current ** ____________________ ________________, that is, a diode changes AC so it acts like ________.	move (flow) only in one direction DC
D-18 A vacuum has very little resistance, and a voltage can cause electrons to _________ across a vacuum, just as it does along a wire or other ______________. 	flow conductor
D-19 A diode contains two terminals, called the cathode and the plate. In this drawing the arrows point to the ____________ and to the ______________. 	cathode plate
D-20 This symbol represents a diode. The arrows point toward the two terminals, the _____________ and the _____________. 	cathode plate

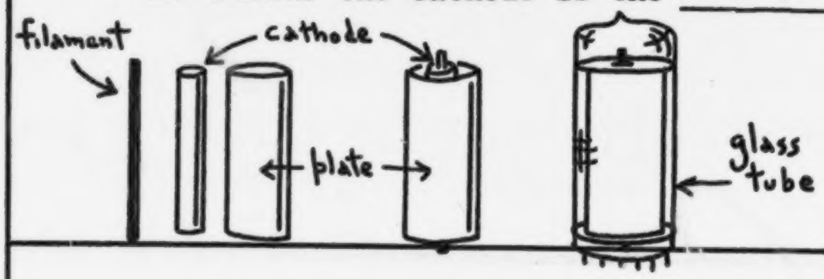
D-61 A tube containing cathode, plate and ____________ is called a triode. Figure A represents a ______________, and figure B represents a ______________.  	grid diode triode
D-62 The amount of ______________ that can pass between the cathode and plate of a triode depends on how _______________ the grid is made.	current negative
D-63 Very small changes in the negative charge of the ___________ will produce very large __________ in the _______________ reaching the plate.	grid changes current
D-64 As the charge on the grid changes, the current through the triode also _____________. Small changes in the * ____________________________ produce large ________________ in the current.	changes charge on the grid changes
D-65 In electronics, we are often concerned with current that fluctuates. Current that is changing is current that _________________.	fluctuates

D-21 The two terminals in a diode are called the * ______________________________. The negative terminal, where electrons come from is the ________________.	cathode and plate cathode
D-22 The symbol for a cathode is ┌ , and the symbol for plate is ⊥ . In this diagram, symbol A is the ______________, and B is the ____________. 	plate cathode
D-23 In addition to a cathode and plate, a vacuum tube diode also contains a filament. By looking at the center of a tube, you can find the ___________________. 	filament
D-24 The symbol for filament is ∧. This is a diagram of a tube which contains a ____________, a cathode, and a ______________. 	filament (either order) plate
D-25 In addition to its terminals, a diode also contains a _______________ which, like the _______________ in a light bulb, glows and emits heat.	filament filament

D-56 The more negative the grid, in comparison to the cathode, the more it will __________ electrons coming from the cathode.	repel
D-57 If the grid is very negative, it will __________ all ______________ from the cathode and no current will reach the ____________. 	repel electrons plate
D-58 If the grid is only slightly negative, it will prevent only ____________ of the electrons from reaching the plate. 	some (few)
D-59 Current must pass through the __________ to reach the plate. The more negative the grid, the ___________ current will reach the plate.	grid less
D-60 A grid regulates current in a vacuum tube because the more negative it is, ** _____________. ____.	the less the current that will flow (the less the current that will reach the plate)

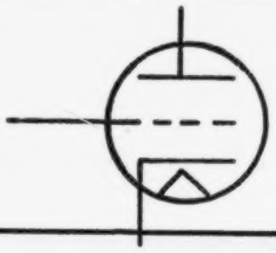
D-26 The cathode in a diode is a substance that emits electrons when it is heated. From this diagram, you can see that the ______ in a diode is heated by the ______. 	cathode filament
D-27 The purpose of the filament is to * ______ ______ so that ______ will "boil off" in large numbers. 	heat the cathode electrons
D-28 The terminals of a diode are called the * ______. A diode also contains a filament which is used to * ______ ______.	cathode and plate heat the cathode
D-29 When the diode is connected so that the filament heats the ______, large numbers of ______ are emitted. 	cathode electrons
D-30 If a source of voltage is connected so that the cathode is negative and the plate is positive, electrons emitted by the cathode will ______ to the ______. 	move (be attracted) (flow) plate

D-51 In modern vacuum tube diodes the plate is a cylinder or tube, with the cathode inside it, and inside the cathode is the ______________.



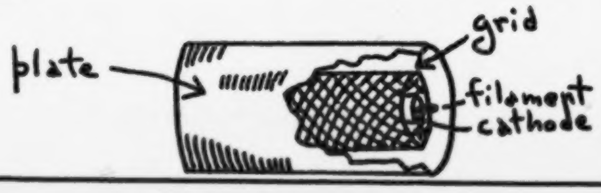
filament

D-52 The flow of current between the cathode and plate can be regulated. A third terminal is needed in a vacuum tube to ______________ the current.



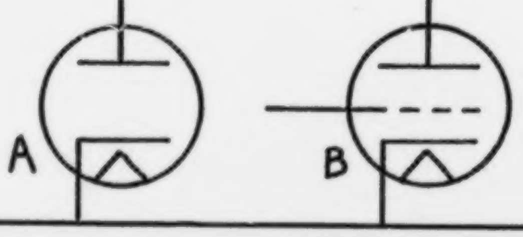
regulate (control)

D-53 A third terminal used to ______________ current in a tube is called a grid. In most tubes, material resembling a screen is used to make the ____________.



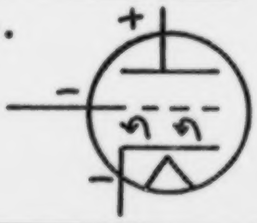
regulate
grid

D-54 Tube A and B each contain a ______________ and a ______________. In addition, tube B contains a ______________.

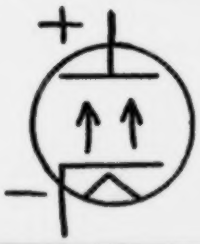
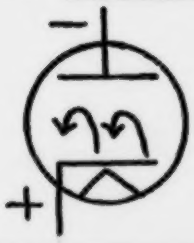
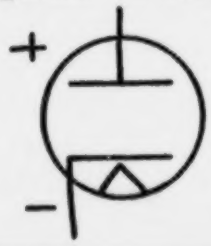
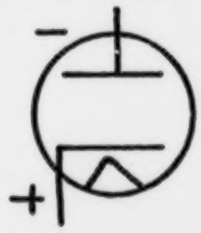
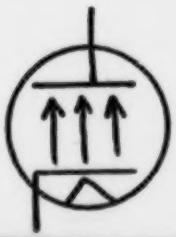


cathode
plate
grid

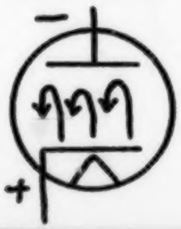
D-55 If the third terminal in a tube, the __________, is made negative, it will affect current flow because it will ____________ electrons coming from the cathode.



grid
repel

D-31 If the plate in a diode is made positive, current will flow from the ______________ to the ____________.	cathode plate
D-32 The cathode in a diode always emits ___________ when it is heated. Current will flow to the plate, however, only when the plate is ________________.	electrons positive
D-33 If the plate is negative instead of positive, it will not _____________ electrons emitted by the cathode. Instead, it will ___________ them.  	attract repel
D-34 AC moves *________________________. Thus, when a diode is connected to a source of AC, the plate is alternately positive and _________.  	back and forth negative
D-35 When a diode is connected to an AC source, the plate is alternately positive and _____________. When the plate is positive it _______________ electrons. 	negative attracts

D-46 DC moves only in * ____________. A diode changes AC to DC because it lets current move through it only in * ____________.	one direction one direction
D-47 The purpose of a diode in a circuit is to change * ____________.	AC to DC
D-48 Any device which changes AC to DC is called a rectifier. A diode, therefore, is one kind of a ____________.	rectifier
D-49 A diode is a ____________, which means that it changes * ____________.	rectifier AC to DC
D-50 A diode is a ____________, which allows current to move * ____________.	rectifier only in one direction

D-36 The ______________ emits electrons whether it is positive or negative, because it is heated by the ________________.	cathode filament
D-37 The plate does not emit electrons, even when it is negative. Only the cathode * ______________ ________________.	emits electrons
D-38 The plate attracts electrons only when it is ______________. The plate repels electrons when it is ________________. 	positive negative
D-39 When the plate is negative, electrons cannot move from cathode to plate because the negative plate will * ______________________________.	repel electrons
D-40 Current can flow through a diode when the plate is ________________, but not when the plate is ________________.	positive negative

0L

D-41 In a diode, electrons can move from the cethode to the plate only when the ** ____________________ ____________________.	plate is positive
D-42 When the plage is negative, ______________ cannot flow through a ______________.	current (electrons) diode
D-43 Current can move through a ____________ from the cathode to the plate, but cannot move from * ____.	diode plate to the cathode
D-44 Alternating current moves * ____________________, but current can move only in * ________________ ________________ through a diode.	back and forth one direction
D-45 When the terminals of a diode are connected to an AC source, current will flow through the tube when the plate is positive, but ** ________________ ____.	no current will flow when the plate is negative

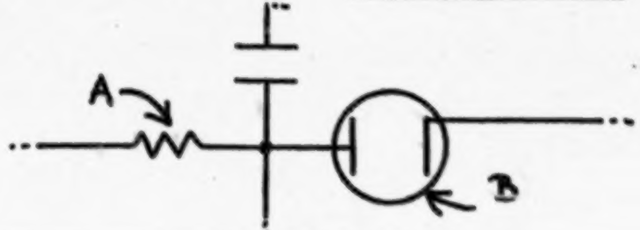
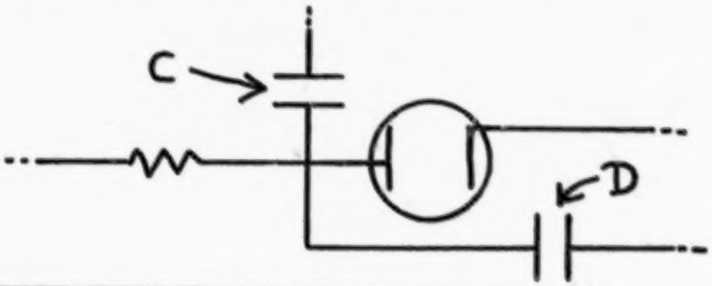
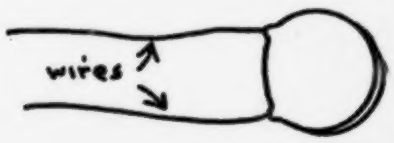
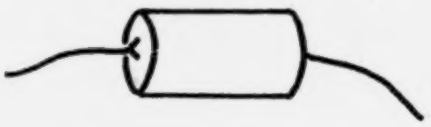
Now turn the book around so the items on the opposite page are right side up. Then begin with Item number 41 and continue on the right hand pages until you reach the end of this unit.

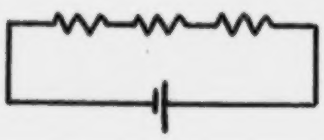
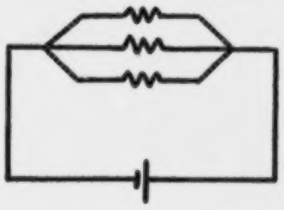
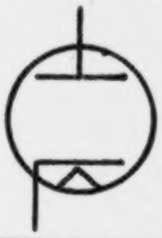
UNIT E

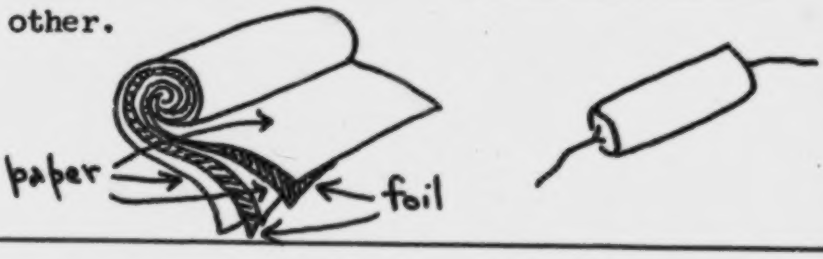
CAPACITORS

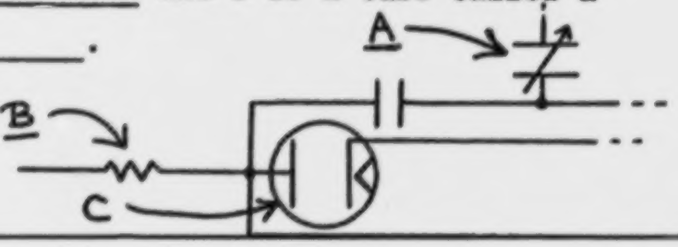
Unit E begins on the next page. Use the cardboard mask as you have done before. Read only the right hand pages.

You have now finished this unit. Turn the book around and go to the next unit.

E-1 This is part of the circuit diagram of a radio. Letter A points to a ______________ and B points to a tube called a ____________. 	resistor diode
E-2 Letter C points to a capacitor. Letter D also points to a ______________. 	capacitor
E-3 The symbol —| |— represents a ______________; but the symbol —||— represents a ____________.	capacitor battery
E-4 A capacitor is basically two metal plates which are close together but not touching. The plates must not touch each other, or the ____________ will ________ work properly.	capacitor not
E-5 There are often several different kinds of capacitors in a radio. These are two kinds of ________________ you may have seen.  	capacitors

E-76 A voltage is a ______________ in the ______________ of two terminals. The terminal with a concentration of negative charges is the ______________.	difference charge cathode
E-77 In a series circuit there is only one * ______________, but in a parallel circuit * ______________.  	path for the current there are several branches for the current
E-78 In a diode the ______________ always emits electrons because it is ______________ by the filament. Electrons are not emitted by the ______________. 	cathode heated plate
E-79 The plate in a diode does ______ emit electrons. A positive plate ____________ electrons from the cathode, but a negative plate * ______________.	not attracts repels electrons
E-80 When the plate in a diode is positive, current can ____________, but when the plate is negative, ** ______________.	flow no current can flow (through the diode)

E-6 Small capacitors are made of layers of paper and metal foil rolled up. The paper is needed to keep the ____________ from ______________ each other. 	plates (foil) touching
E-7 Because the plates do not touch, DC cannot flow through a ______________. A capacitor will block * ___________________________.	capacitor direct current
E-8 A capacitor will block direct current but will not ____________ alternating current. DC, but not AC, will be _____________ by a _________________.	block blocked capacitor
E-9 Some circuits contain both AC and DC. A capacitor will allow $____ to pass but will _____ allow $____ to pass.	AC not DC
E-10 A capacitor will not pass $____ but will * ___________________________.	DC pass AC (allow AC to pass)

E-71 If the frequency of AC is _________ enough, a capacitor in an AC circuit will not become fully ______________, and will not _____________ the AC.	high charged block (interfere with)
E-72 A capacitor provides some interference for AC having a _________ frequency if the ____________ of the capacitor is also _________.	low capacitance low
E-73 There are several components in this circuit. A is a _______________ capacitor, B is a _______________ and C is a tube called a _____________. 	variable resistor diode
E-74 A capacitor blocks $______ and opposes the flow of some _________________ current if the _________________ of the capacitor or the _______________ of the current are low.	DC alternating capacitance frequency
E-75 A resistor opposes the flow of both $_____ and $_____. A capacitor blocks all _____________ current and opposes the flow of some *__________ ________________________.	AC DC direct alternating current

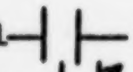
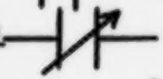
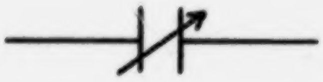
E-11 To understand why a capacitor passes only $________, you must understand more about this kind of current. AC, you remember, stand for * ____.	AC alternating current
E-12 Direct current moves only in one direction, while alternating current moves * ____________________.	back and forth (first in one direction, then in the other)
E-13 The number of times AC moves * ________________ in one second is called the frequency of the current. Each alternating current has a characteristic ____________________.	back and forth frequency
E-14 Alternating current moves * ____________________. The number of times it moves * ________________ ______________ in one second is called the __________________ of the current.	back and forth back and forth frequency
E-15 The ________________ of an alternating current is measured in cycles. One complete movement, first in one direction and then in the other, is one ______________.	frequency cycle

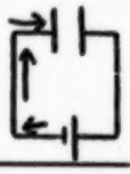
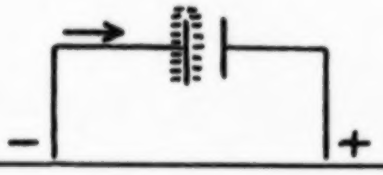
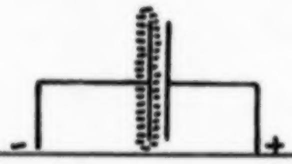
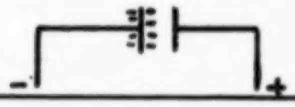
E-66 A capacitor consists basically of two metal ___________ separated by an _________________. 	plates insulator
E-67 A capacitor can store ____________ and will block all $_____.	charge DC
E-68 The amount of charge a capacitor can store depends on its ________________.	capacitance
E-69 The greater the ________________ of a capacitor, the ___________ __ charge it can store.	capacitance more
E-70 DC moves only in one direction, but AC ** ________ ____________________. The frequency of an alternating current is measured in * __________ __________________________.	moves back and forth cycles per second

E-16 A current that moves back and forth 60 times in one second has a frequency of 60 ____________ per second. The abbreviation cps stands for * ______________________________.	cycles cycles per second
E-17 The _________________ of an alternating current is measured in cps, or * _____________ ________________. One kilocycle means 1,000 cps and 5 kilocycles means * _____________.	frequency cycles per second 5,000 cps.
E-18 A kilocycle is a _________________ of one _____________ cycles per second. So 1,000 cps can be written one _____________.	frequency thousand kilocycle
E-19 One thousand cycles per second is the same as one ________________, which is how the ______________ of some alternating currents is measured.	kilocycle frequency
E-20 A megacycle is one million * _________________, therefore 1,000,000 cps is the same as one _________________.	cycles per second megacycle

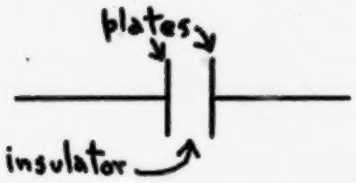
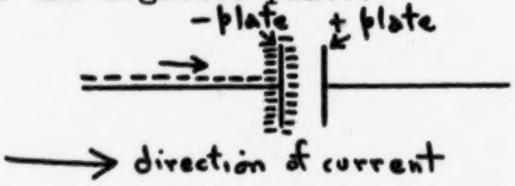
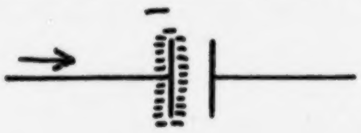
E-61 When capacitance is low, only AC with a very high ______________ will flow without interference. By adjusting capacitance, you can block alternating currents having very low ______________.	frequency frequencies
E-62 When capacitance is very high, only $____ will be blocked. When capacitance is very low, $____ having very ________ frequencies will also be blocked.	DC AC low
E-63 A variable capacitor can be adjusted to vary its ______________. A capacitor interferes with AC depending upon the ______________ of the current and the ______________ of the capacitor.	capacitance frequency capacitance
E-64 AC can be selectively blocked by a ____________ capacitor. Capacitors have greater effect upon *______________________ AC than upon *__________________________.	variable low frequency high frequency AC
E-65 A capacitor will block $____. It will also block $_____ depending on the capacitor's ________________ and the current's ______________.	DC AC capacitance frequency

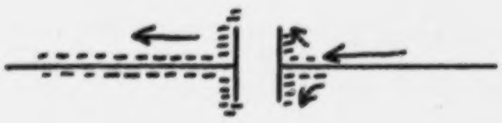
E-21 One million cycles per second is one __________, and 1,000 cps is one ______________.	megacycle kilocycle
E-22 One kilocycle means * ______________________ cps, and one megacycle means * ______________ ____________________.	one thousand one million cps
E-23 A current of 500 cps is moving back and forth at a lower ________________ than a current of 800 cps.	frequency
E-24 The higher the number of ___________ per second, the higher the _____________ of the current.	cycles frequency
E-25 The fact that alternating current moves * _______ _______________ is important in understanding why a capacitor blocks $_____ but not $_____.	back and forth DC AC

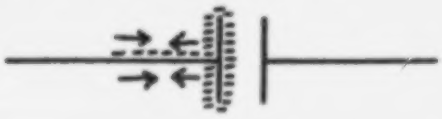
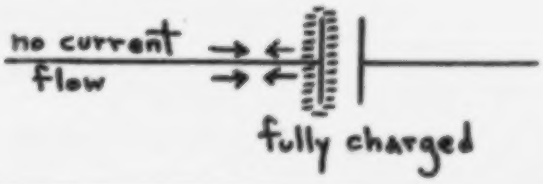
E-56 A capacitor will always block $______. It may block $_____ if the current has a __________ frequency or if the capacitor has a *__________ ____________________.	DC AC low low capacitance
E-57 The symbol  represents a ______________. The symbol  also represents a ______________, but one having capacitance that can be changed.	capacitor capacitor
E-58 A capacitor with capacitance that can be changed is called a variable capacitor. This symbol represents a *________________________. 	variable capacitor
E-59 A capacitor with plates that can be adjusted to change its _______________ is called a *________________________.	capacitance variable capacitor
E-60 A capacitor's limit for storing charges is increased when its *___________________ _______________.	capacitance is increased

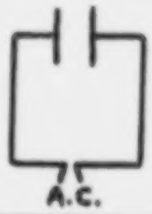
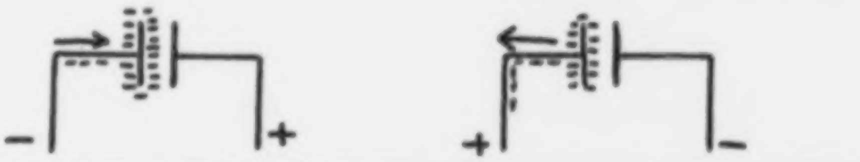
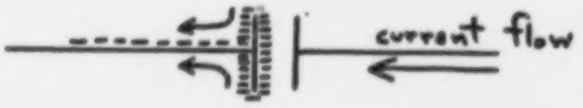
E-26 When a DC circuit includes a capacitor, electrons flow from the __________ of the battery or other source, along a ______________, until they reach the ______________. 	cathode conductor (wire) capacitor
E-27 A capacitor can store electrons. When electrons flowing along a conductor reach a capacitor, they will be __________ in the negative plate. 	stored
E-28 A capacitor can * ____________________, but only up to a limit. The larger the plates and the closer together they are, the larger the number of * ______________________________.  	store electrons electrons that can be stored
E-29 The amount of electrons, or charge, a capacitor can store is called capacitance. A capacitor with large plates, close together, has a high ______________.	capacitance
E-30 Capacitors differ in amount of ______________, which means their ability to store up ______________.	capacitance electrons (negative charges)

E-51 High frequency AC changes direction so ________ that a capacitor has little time in which to become * ________.	frequently (rapidly) (often) fully charged
E-52 The greater the frequency of the AC, the ________ likely it is that the capacitance of the capacitor will be reached.	less
E-53 A capacitor blocks DC. Sometimes it will also block AC if the current does not change direction rapidly, that is if it has a * ________.	low frequency
E-54 If a capacitor is in the circuit, current will flow onto one plate until the limit, or ________, of the capacitor is reached or until the current flows * ________ ________.	capacitance in the opposite direction
E-55 When a circuit contains a capacitor, current will stop flowing when ** ________ ________, unless the current * ________.	the capacitor becomes fully charged (when the capacitance is reached) changes direction

E-31 Capacitors can store electrons. A capacitor which has a high ____________ can store * ____________________ than a capacitor with a * ____________________.	capacitance more electrons (charge) low (small) capacitance
E-32 A capacitor consists of two metal plates separated by an insulator, which means that current cannot flow from the one plate to the * ______________. 	other plate
E-33 When a capacitor is connected to a source of voltage, an * ________________ begins to flow, and * ____________________ will flow onto the negative plate. 	electric current negative charges (electric current) (electrons)
E-34 There is an insulator between two plates of a capacitor, which means that * ____________ ____________ cannot flow from ** __________ ____________________.	electric current (electrons) one plate to the other plate
E-35 Because charges cannot flow through the ______________ between the two plates, electrons begin to pile up on one plate giving it a ______________ charge. 	insulator negative

E-46	When AC changes direction, the electrons stored on one __________ flow out of the capacitor, while electrons flow onto the other __________. 	plate plate
E-47	Capacitance indicates the amount of charge a capacitor can store. A capacitor with large __________________ can ____________ more charge than a capacitor with *_____________ __________________.	capacitance store small (less) capacitance
E-48	The larger the ______________ of the capacitor, the _____________ the amount of charge that a capacitor can _____________.	capacitance greater (larger) store
E-49	The more frequently AC changes direction, the ________ likely it is that the capacitor will reach its limit, which is called its ___________________.	less capacitance
E-50	How frequently AC changes direction is called its _______________. The greater the number of cps or *____________________________, the greater is the ________________ of the current.	frequency cycles per second frequency

E-36 When the plate connected to a cathode has stored its limit of electrons, that is, it has reached its ____________________, it will ____________ additional negative charges. 	capacitance (limit) repel
E-37 Electrons flowing toward a capacitor which is fully charged will be __________________, and the current will ____________ flowing.  	repelled stop
E-38 DC cannot pass through a capacitor because soon after the ________________ has begun flowing, the capacitor will become fully charged and will _____________ the DC.	current (electrons) stop (block)
E-39 DC moves only in __________ direction; therefore, as a capacitor becomes fully ______________, it completely *______________________________.	one charged stops (blocks) the current
E-40 A capacitor blocks current only when its limit for storing charge, that is its ______________, has been reached. The greater its ______________ the ________________ current will flow.	capacitance capacitance longer

E-41 When a capacitor is connected in an AC circuit, it will store electrons so long as the current moves only in __________ direction.  	one
E-42 When AC changes direction, the capacitor plate that was negative now is connected to the ________________ terminal of the source, and electrons will flow * ______________ that plate.  	positive off of (out of)
E-43 AC moves * ________________________. As soon as a current changes direction, __________________ will flow away from a fully charged ____________.  	back and forth electrons (charges) capacitor (plate)
E-44 Every time AC changes direction, the capacitor discharges; that is, the _______________ will flow __________ of the capacitor.	electrons out
E-45 If the AC in a circuit has a high enough frequency, the current will always ___________ direction before a capacitor becomes fully ______________.	change charged

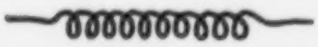
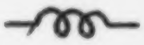
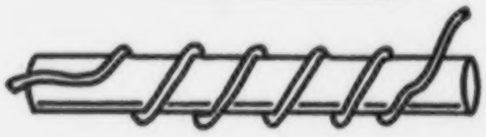
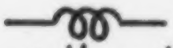
Now turn the book around so the items on the opposite page are right side up. Then begin with Item number 41 and continue on the right hand pages until you reach the end of this unit.

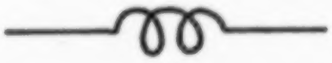
UNIT F

COILS AND TUNER CIRCUITS

Unit F begins on the next page. Use the cardboard mask as you have done before. Read only the right hand pages.

You have now finished this unit. Turn the book around and go on to the next unit.

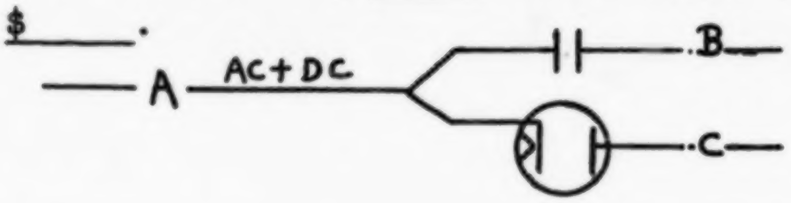
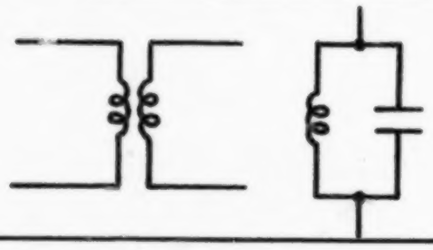
F-1 Current that moves only in one direction is called ________ current. Current that moves back and forth is called * ________ ________.	direct (DC) alternating current (AC)
F-2 Every conductor has some resistance for both AC and DC. Even copper wires have some ________ for both * ________.	resistance AC and DC
F-3 Every conductor has a certain amount of resistance, which means a tendency to ** ________ ________.	oppose (resist) the flow of current (movement of electrons)
F-4 If a wire is wound into a coil, its DC resistance remains the same, but its * ________ becomes ________.  coiled wire	AC resistance changed (different)
F-5 As shown in the figure, a coil is made by winding fine wire around a core. The symbol  stands for a ________.   coil symbol	coil

F-76 A diode is a rectifier, a triode is an __________, which is used to increase the size of __________________ in current.	amplifier fluctuations (changes)
F-77 This drawing shows a ____________, which has ______________, just as a capacitor has _______________. 	coil inductance capacitance
END OF UNIT	

F-6 Both AC and DC can flow through the wire in a coil, and all wire has resistance, but a ____________ has added ____________ for AC.	coil resistance
F-7 If the wire is wound into a coil, its resistance for DC remains *____________, but resistance for AC becomes ____________.	the same (unchanged) greater
F-8 A capacitor affects the flow of AC, depending on the ____________ of the current. A coil also affects the *____________, depending on the *____________ ____________.	frequency flow of AC frequency of the current
F-9 Just as a capacitor has a capacitance, a coil has inductance. The effect of a coil depends on the frequency of the current and on the coil's ____________.	inductance
F-10 The effect of a coil in an $____ circuit depends on its ____________. A coil does not affect the flow of $______ current.	AC inductance DC

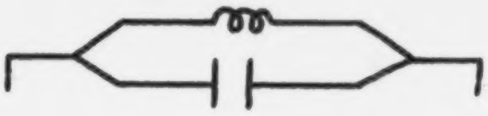
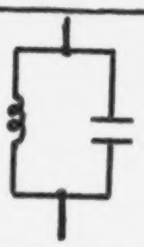
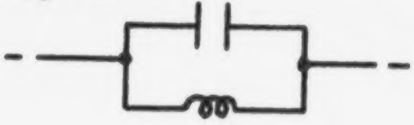
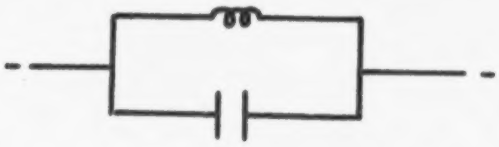
F-71 A coil has inductance because current flowing through it produces a magnetic field. The more windings on a ________, the greater is its ______________.	coil inductance
F-72 A coil passes ________ frequency AC more easily than * __________________________ AC.	low high frequency
F-73 The frequency to which a tuner circuit is tuned depends on the ______________ of the variable capacitor and the * _______________________.	capacitance inductance of the coil
F-74 A diode is a __________; it will pass $____ but * ____________________.	rectifier DC will not pass AC
F-75 A triode contains a filament and three terminals called * ______________________________.	the cathode, the plate and the grid

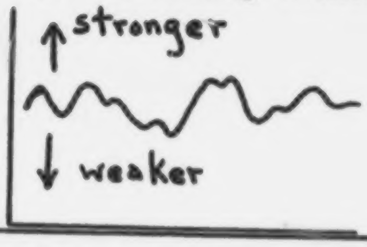
F-11 A coil has inductance because current flowing through it produces a magnetic field. The more windings on the __________, the greater the strength of the field.	coil
F-12 Reversing the direction of current in a coil reverses the poles of the magnetic field. This produces, in the coil, added resistance to current, called ____________________.	inductance
F-13 The more rapidly that current changes direction in a ___________, the greater the ____________ and the greater the ______________ to current.	coil inductance resistance
F-14 Since inductance occurs because the direction of current is changed, a coil has no added ____________ for $____, but does have *_______ __________________ for $____.	resistance DC added resistance AC
F-15 The more rapidly current alternates, the higher is its frequency. High frequency AC has a ___________ number of __________ per second.	greater (larger) (higher) cycles

F-66 A rectifier, or diode, will pass only $______. In the diagram, wire A carries both AC and DC; wire B carries only $______, and C carries only $______.  	DC AC DC
F-67 Some radio circuits contain both AC and DC. These can be separated, where necessary, by capacitors, rectifiers and ______________.	transformers
F-68 A transformer basically consists of *______ ______ side by side. A tuned circuit consists basically of **______________. 	two coils a coil and a (variable) capacitor (in a parallel circuit)
F-69 Both AC and DC pass through a ________, but a ______________ blocks all DC and a ______________ blocks DC that is not fluctuating.	coil capacitor transformer
F-70 A coil passes lower frequency currents more easily than *______________. A capacitor, on the other hand, **______________ ______________.	higher frequency currents passes higher frequency currents more easily than lower frequency currents

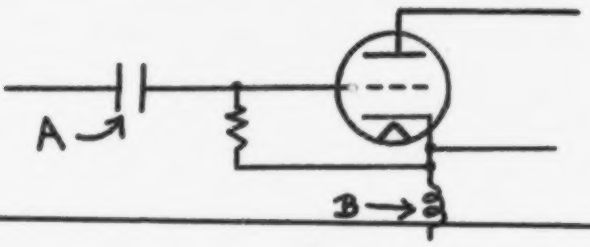
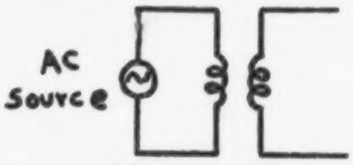
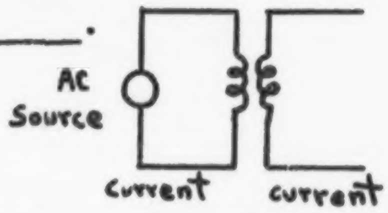
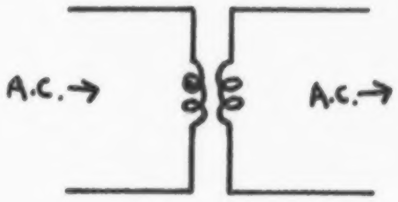
F-16 The higher the frequency of AC, the greater the amount of added resistance, or ______________, in a coil in the circuit.	inductance
F-17 A coil will have greater added resistance for ________ frequency alternating currents than it has for * __________________________ AC.	high low frequency
F-18 The inductance of a coil increases when ** __________________________________. This means it will have more added resistance for ** __________________________________.	the frequency of the current increases the flow of (alternating) current
F-19 A coil causes no added resistance for $_____. It does add resistance for $_____, however, which is greatest for AC with the * __________________________.	DC AC higher frequencies
F-20 Unlike a coil, a capacitor completely blocks $____. The effect of a capacitor in an AC circuit is smallest when the current's frequency is ____________.	DC high

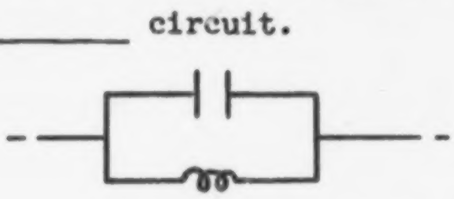
F-61 Fluctuate means "to change". Direct current that constantly changes in strength is called a ____________________ DC.	fluctuating
F-62 A transformer blocks any current that is not constantly changing. A transformer will not block either AC or ____________________ DC because they are constantly ______________.	fluctuating changing
F-63 A transformer will not pass DC unless the DC is _________________. A rectifier will pass all direct currents, but will not pass any *______________________________.	fluctuating alternating currents
F-64 *A constant DC will pass through a* ______________, but cannot pass through a capacitor or through a ___________________.	rectifier transformer
F-65 A capacitor will pass high frequency $______, but will not *____________________. A transformer will pass both **_________________ ___________________________.	AC pass any DC (pass very low frequency AC) AC and fluctuating DC

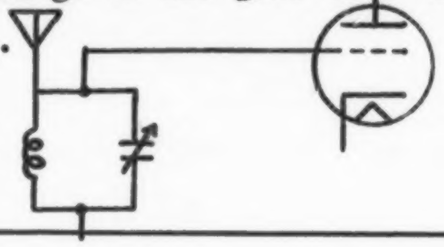
F-21 This circuit contains a __________ and a __________________ connected in parallel. 	coil capacitor
F-22 A capacitor and a coil connected in parallel is called a tuner circuit. This diagram represents a * __________________________. 	tuner circuit
F-23 If DC is fed into this * ________________________, all of it will flow through the __________, since the ___________________ does not permit the flow of any DC. 	tuner circuit coil capacitor
F-24 When AC is fed into this * ______________________, the current may pass through either of the branches, depending on the ________________ of the current. 	tuner circuit frequency
F-25 In a tuner circuit, the capacitor has greatest resistance to __________ frequency AC, and the coil has greatest resistance to * ______________ __________________.	low high frequency AC

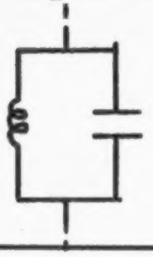
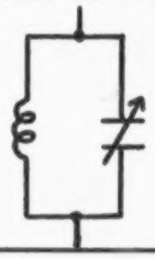
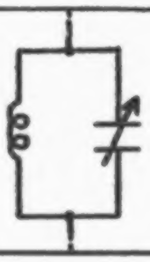
F-56 Transformers are used to change the ____________ of current. In a radio, they have an additional purpose. Some currents can be blocked by a ________________.	voltage transformer
F-57 Alternating currents move back and forth, that is, alternating currents are constantly changing ______________.	direction
F-58 DC always moves only in *_________________, but some direct currents fluctuate, which means they constantly change in strength becoming either weaker or ___________. 	one direction stronger
F-59 A fluctuating direct current constantly changes in strength. A DC that does not fluctuate does not *____________________________.	change in strength
F-60 AC constantly changes _____________, while fluctuating DC constantly changes in _________.	direction strength

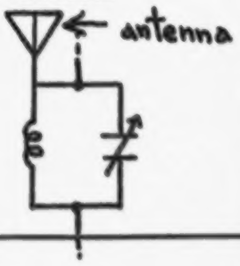
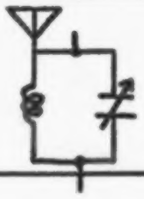
F-26 As a whole, the tuner circuit does not resist very low frequency AC since it can pass easily through the ____________.	coil
F-27 A tuner circuit does not resist low frequency AC. It also does not resist very high frequency AC, since it easily passes through the ____________.	capacitor
F-28 Both the coil and the capacitor resist middle frequency AC. Thus, the total resistance produced in the tuner circuit will be greatest for ______________ frequency AC.	middle (medium)
F-29 A resistor reduces the flow of current but it also increases voltage. For a constant amount of current, voltage is highest where ______________ is greatest.	resistance
F-30 A tuner circuit has maximum resistance for one specific frequency. Because resistance is greatest at that frequency, it will also have the highest ________________.	voltage

F-51 You can now identify most of the components of the radio you are to build. In this diagram A is a ______________ and B is a __________. 	capacitor coil
F-52 Two coils drawn side by side represent a transformer. Notice that there is no wire connection between the two __________ in a ________________. 	coils (circuits) transformer
F-53 Although the two coils in a ______________ are not connected together, an alternating current in one coil magnetically produces an alternating current in the other _________. 	transformer coil
F-54 AC in one coil of a ______________ magnetically produces AC in the other ________. 	transformer coil
F-55 Transformers can be used to change the voltage of current. To change high voltage current to *______________________, a ____________ can be used.	low voltage current transformer

F-31 A tuner circuit increases voltage at one frequency more than at * ______________________, thus, it picks out one particular frequency by giving it greatest ______________.	other frequencies voltage
F-32 A tuner circuit consists of a _________ and a ____________ arranged in ______________. Resistance to low frequencies is provided by the _______________.	coil capacitor parallel capacitor
F-33 A tuner circuit will pick out a particular frequency because it has greatest ____________ for only one frequency and thus gives it the highest _______________.	resistance voltage
F-34 Tuner circuits are used to ** ________________ ____.	pick out a particular frequency (and give it highest voltage)
F-35 A tuner circuit where the frequency is fixed and cannot be varied is called a tuned circuit. This is a _____________ circuit. 	tuned

F-46 The current leaving the tuner has highest ________ at only one frequency. This current can then go to the grid of a tube, a ________. 	voltage triode
F-47 A tube having a cathode, plate and grid is called a ________. Current can be amplified by a ________.	triode triode
F-48 In radio reception, radio waves are sensed by the ________ which sends current to the * ________, where current at a particular ________ is picked out.	antenna tuner circuit frequency
F-49 When it leaves the tuner circuit, current at one particular ________ has the highest ________. This current can then go to the ________ of a triode for amplification.	frequency voltage grid
F-50 Many radios have very complex tuner circuits, but in every radio, the * ________ has the same purpose, to ** ________ ________.	tuner circuit pick out one frequency and give it highest voltage

F-36 Tuner circuits having set coils and set capacitors cannot be varied to pick out different __________. These circuits are called * ____________________.	frequencies tuned circuits
F-37 The frequency to which this circuit is set depends on both the ______________ of the coil and the ______________ of the capacitor. 	inductance capacitance
F-38 In this circuit the capacitor is a ___________ capacitor, which means that the ______________ of the capacitor can be changed. 	variable capacitance
F-39 A tuner circuit can be changed to pick out different ________________, but a tuned circuit is always tuned to the * ____________________.	frequencies same frequency
F-40 By changing the capacitance of the * __________ __________________ in this circuit, the circuit can be tuned or set to * ______________________ ______________. 	variable capacitor different frequencies

F-41 Radio stations broadcast at different frequencies. Every radio has a * ______________________ to select one particular _______________ so you hear only one _____________.	tuner circuit (variable capacitor) frequency station
F-42 A tuner consists of ** ______________________ __________ connected in ______________. It is used to tune a radio to different ______________.	(variable) capacitor and a coil parallel stations (frequencies)
F-43 Radios generally contain a circuit like this. It contains a * ___________________ plus an antenna. Radio waves broadcast by a station are sensed by the ________________. 	tuner circuit antenna
F-44 Radio waves produce current fluctuations in the antenna. From the ______________, the current enters a * ______________________ consisting of a * ______________________________ arranged in parallel. 	antenna tuner circuit variable capacitor and a coil
F-45 Current having several different frequencies enters the tuner circuit from the ___________. The tuner circuit then picks out one particular ________________ by giving it greater _________.	antenna frequency voltage

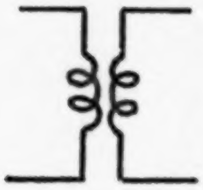
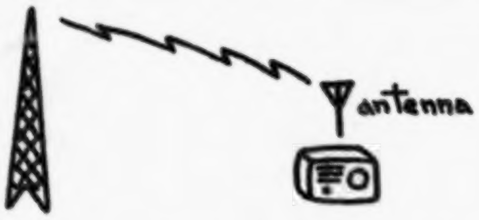
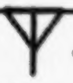
Now turn the book around so the items on the opposite page are right side up. Then begin with Item number 41 and continue on the right hand pages until you reach the end of this unit.

UNIT G

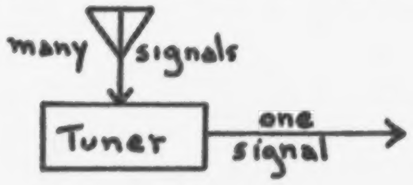
RADIO CIRCUITS

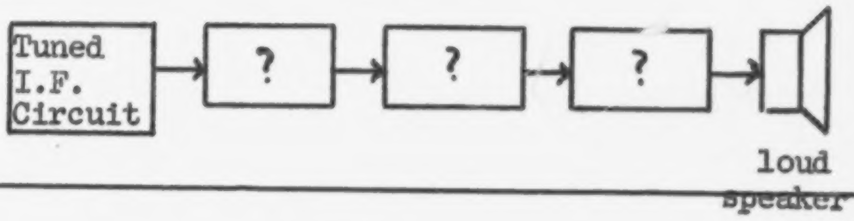
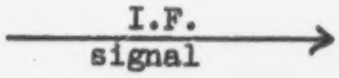
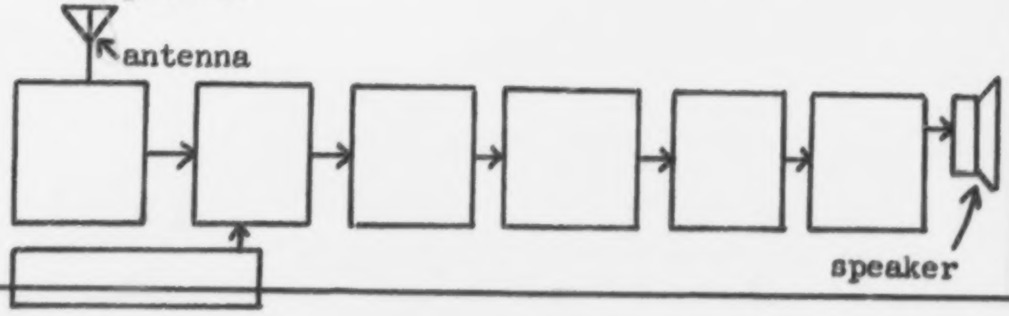
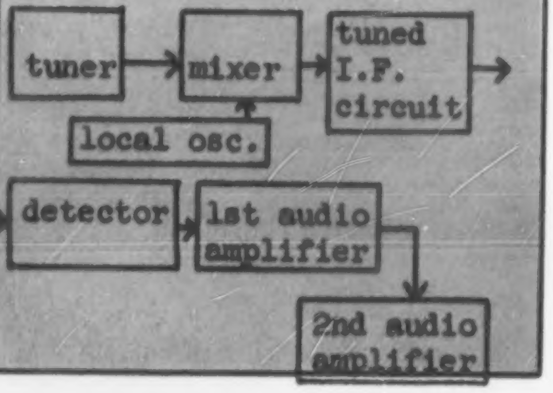
Unit G begins on the next page. Use the cardboard mask as you have done before. Read only the right hand pages.

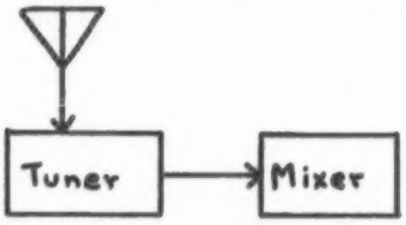
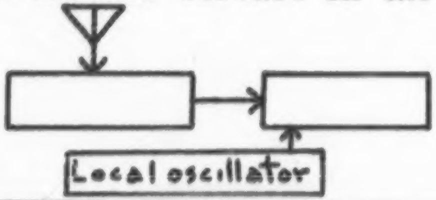
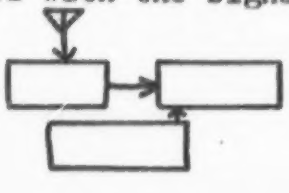
You have now finished this unit. Turn the book around and go on to the next unit.

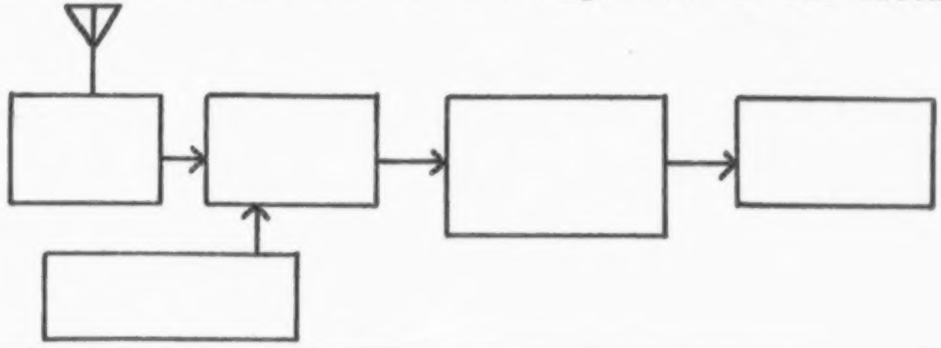
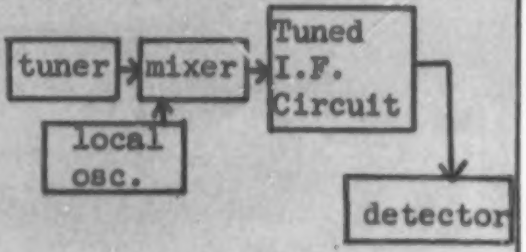
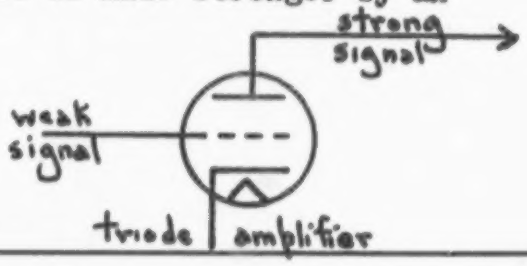
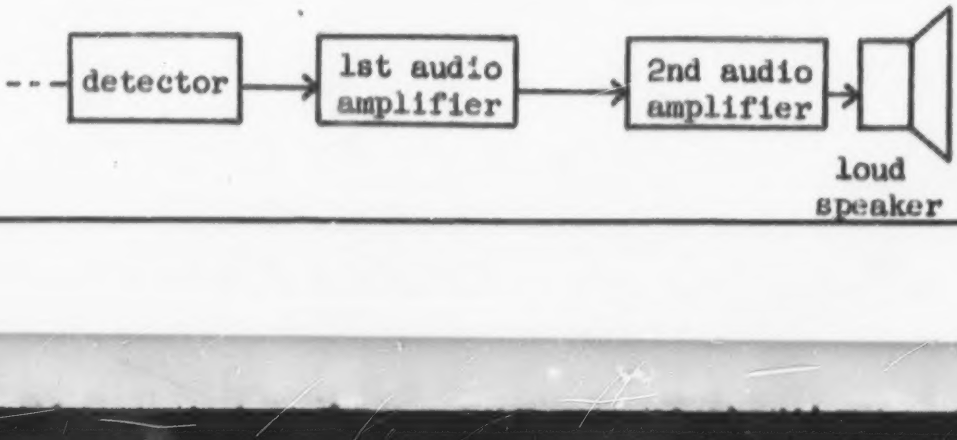
G-1 You remember that if two coils are placed near each other, and an AC current is present in one coil, an * ________________ will be produced in the other __________. 	AC current coil
G-2 A broadcasting antenna and a receiving antenna are like two coils. A current in the broadcasting antenna produces a ____________ in the * ______ ________________. 	current receiving antenna
G-3 The symbol for antenna is . A radio station broadcasts radio waves which produce a current in the receiving ____________.	antenna
G-4 Every radio station produces a current having a different frequency. For example, Civil Defense has two stations; one produces current with a ______________ of 640 kilocycles, and the other, 1240 kilocycles.	frequency
G-5 A radio antenna receives radio waves from all nearby stations. No matter to which station the dial is turned, the ____________ receives waves from ____________ stations.	antenna many (all nearby)

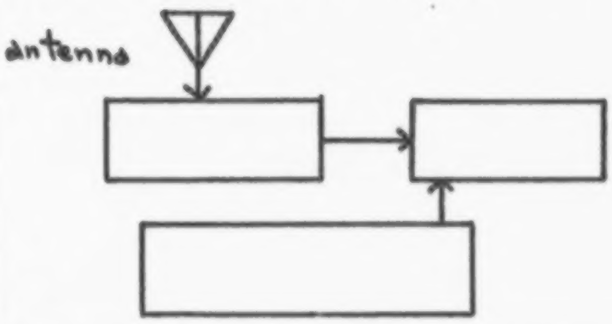
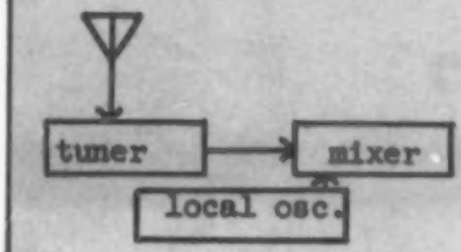
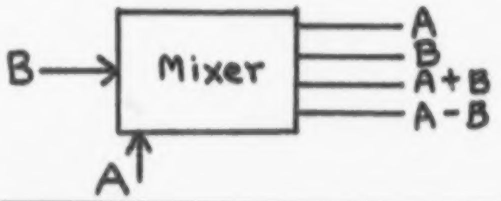
G-76 The tuned I.F. circuit passes only the $_____ signal along to the next component, which is the ________________.	I.F. detector
G-77 The detector separates the low frequency ________ signal from the *______________________________, and passes it on to the *______________________________ ________________.	audio (high frequency) I.F. signal first audio amplifier
END OF UNIT	

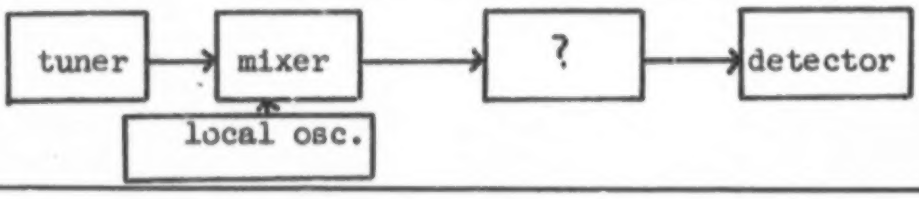
G-6 Currents are produced in an antenna by all nearby broadcasting stations, but each current in the __________ comes from a different station and has a different __________.	antenna frequency
G-7 Current from the antenna goes to the __________ circuit, usually abbreviated tuner. Current at only one __________ is selected by the __________.	tuner frequency tuner
G-8 A radio has many circuits. One circuit supplies current to the tube filaments. Another carries __________ from the antenna to the __________.	current tuner
G-9 A current in a radio produced by radio waves is called a signal. Thus, the current selected by the tuner is called a __________.	signal
G-10 A tuner selects only one signal from the antenna. The __________ selects the __________ from a particular station by giving it a higher __________. 	tuner signal voltage

G-71 The audio signal is separated from the I.F. signal by the ________, which then sends the audio signal to the first * ________ ________.	detector audio amplifier
G-72 After leaving the tuned I.F. circuit, the signal flows through the ** ________ ________, and a loud speaker.  Tuned I.F. Circuit ? ? ? loud speaker	detector, two audio amplifiers
G-73 The first part of most radios is the superheterodyne circuit, which selects one signal received by the ________, and converts it to an $ ________ signal. 	antenna I.F.
G-74 Following the superheterodyne components, the I.F. signal is converted to an ________ signal which is then ________ and used to drive a loud speaker.	I.F. audio amplified
G-75 Fill in each block with the name of that component.  antenna speaker	 tuner mixer tuned I.F. circuit local osc. detector 1st audio amplifier 2nd audio amplifier

G-11 The __________ selects one station signal from those received at the ______________ and then amplifies it by sending it to the _________ of a tube.	tuner antenna grid
G-12 The amplified signal goes from the tuner to the mixer. Both the ____________ and the ________ are specialized circuits in a radio.  	tuner mixer
G-13 In a radio, signals go from the _____________ to the tuner. The ____________ is then passed on to the next circuit, the ______________.	antenna signal mixer
G-14 The ____________ combines two signals: one comes from the ___________; the other from the local oscillator. The * ______________________ is another circuit in the radio.  	mixer tuner local oscillator
G-15 The local _________________ is like a small transmitter. It produces a signal which is fed to the ___________ and mixed with the signal from the ____________. 	oscillator mixer tuner

G-66 Write the names of the components in the blocks. 	 tuner mixer Tuned I.F. Circuit local osc. detector
G-67 The detector passes only the __________ signal, and not the $_____. The audio signal has a much lower ___________________ than the * ______ ___________________.	audio I.F. frequency I.F. signal
G-68 An amplifier will amplify a signal; that is, make it stronger. The audio signal leaving the _______________ must be made stronger by an _______________.  strong signal weak signal triode amplifier	detector amplifier
G-69 The audio signal must be _________________, or made larger, so the circuit following the detector in a radio is an ____________________ which increases the audio signal.	amplified amplifier
G-70 Between the detector and the speaker of a radio are two * _________________________________ which _______________ the audio signal.  detector 1st audio amplifier 2nd audio amplifier loud speaker	audio amplifiers (amplifier circuits) amplify

G-16 Signals from the tuner and the * ______________ ______________ are combined by the ______________. The mixer also amplifies these signals; which means that it makes them ______________.	local oscillator mixer larger (stronger) (louder is not quite correct, since these signals cannot yet be heard)
G-17 Write in the correct name of each component. 	
G-18 The mixer combines two signals, signal A and signal B. Their total is A + B, and their difference is $ ______________.	A - B
G-19 The mixer receives # ____ signals, combines them and passes on each signal, their sum, and their difference. The mixer, therefore, passes on # ____ signals. 	2 4
G-20 In most radios, the signal sent to the mixer by the local ______________ is higher in frequency than the signal from the ______________.	oscillator tuner

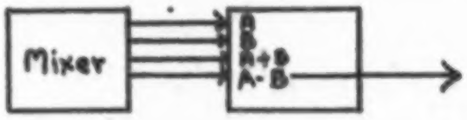
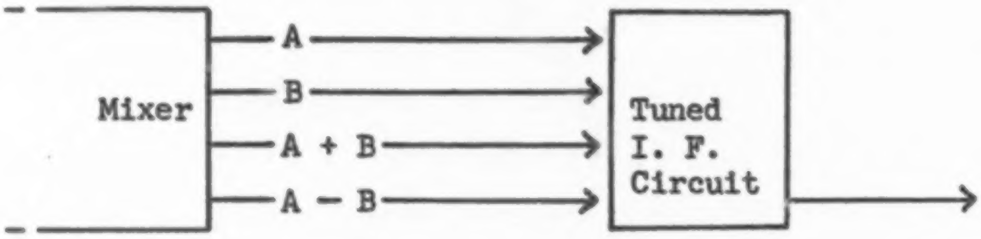
G-61	The I.F. signal contains an audio signal with a frequency between 20 and 20,000 cps. This low frequency * ________________ must be separated out.	audio signal (audio frequency)
G-62	The low frequency ________ signal must be separated from the rest of the high frequency $ ____ signal.	audio I.F.
G-63	The audio and I.F. signals both flow into a circuit called the detector. These signals are separated by the __________, which follows the * ________________.  	detector tuned I.F. circuit
G-64	Combined with the I.F. signal is the ________ signal, which can be __________ from the I.F. signal by the __________.	audio separated detector
G-65	The detector comes after the * ________________ __________. The purpose of the detector is to * ________________________ ________________________.	tuned I.F. circuit separate the audio signal from the I.F. signal

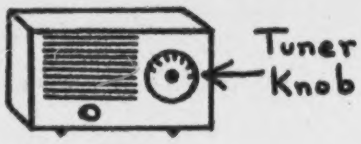
G-21 The local __________ is adjusted along with the tuner by the variable __________. This adjusts the frequency of the signal produced by the * ______________________.	oscillator capacitor local oscillator
G-22 Both the tuner and the local oscillator are adjusted simultaneously by the * __________ __________. Adjusting the local oscillator changes the __________ of its signal.	variable capacitor frequency
G-23 The local oscillator is adjusted so the __________ of the signal it produces is ________ than the signal from the tuner.	frequency higher
G-24 The mixer receives signals from both the ________ and the * ______________________. The mixer sends out four signals, the two it received, their sum, and their ____________.	tuner local oscillator difference
G-25 When the variable capacitor is adjusted to lower the frequency the tuner selects, the local oscillator is simultaneously adjusted so the frequency it emits is __________ also.	lower

G-56 The word audible means "can be heard"; thus, an audio frequency is one that *______________. The I.F. signal is not an ____________ frequency.	can be heard audio
G-57 The human ear can hear only frequencies between 20 and 20,000 cycles per second, so frequencies in that range are called __________ frequencies.	audio
G-58 The I.F. signal is at a single ____________, but different cycles have different voltages. During some cycles, the _____________ is higher than during others.	frequency voltage
G-59 The frequency of the I.F. signal never _________, but the voltage during each cycle can _________. These fluctuations in ____________ are called the audio signal.	changes change voltage
G-60 Voltage fluctuations in the I.F. signal are called the ____________ signal. These voltage fluctuations, produced by the broadcast station, are sensed by the radio's ____________.	audio antenna

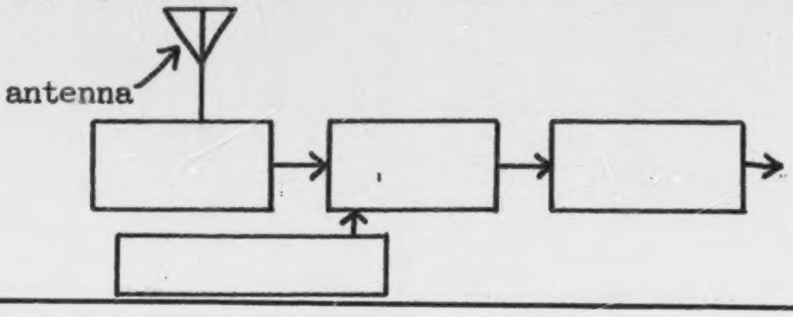
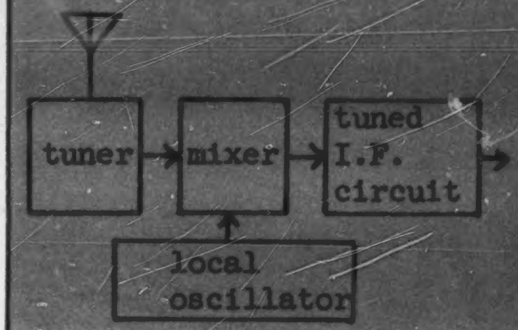
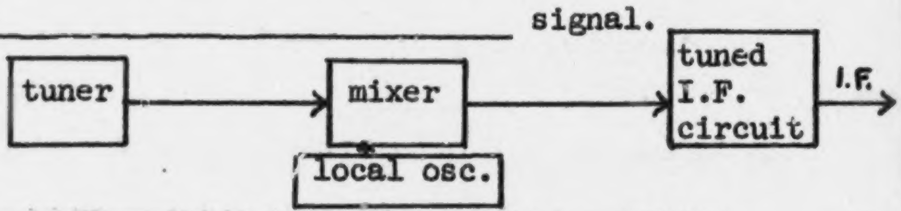
G-26 When the frequency of the signal from the tuner is increased, the * ________________________ given out by the local oscillator is also ____________.	frequency of the signal increased
G-27 The frequency of the signal from the local oscillator is adjusted so it is always a set amount greater than the ** ________________ __________________________.	frequency of the signal from the tuner
G-28 Because the local oscillator signal is always a set amount __________ in frequency than the tuner signal, the difference between them is always the __________.	higher same
G-29 The difference between the local oscillator and tuner signal frequencies is called the intermediate frequency. The ____________ frequency is always * __________________.	intermediate the same
G-30 The intermediate frequency is the ____________ between the frequencies of the tuner and oscillator signals. The * __________________ ____________ never changes, it always * ______________________.	difference intermediate frequency remains the same

G-51 The tuned I.F. circuit always passes a signal with exactly the same ____________ in a ____________________ radio. This signal is the $______ signal.	frequency superheterodyne I.F.
G-52 The superheterodyne principle means that the mixer mixes #____ signals together to produce an *__________________________ signal that always has *____________________.	2 intermediate frequency the same frequency
G-53 The superheterodyne principle means **__________ ______________________________________ ____________________________.	two signals are combined and a constant I.F. signal is produced
G-54 Since the _____________________ principle changes all incoming signals to the same frequency, many tuning circuits in a radio can be pretuned to this $_____ signal.	superheterodyne I.F.
G-55 A radio contains several circuits tuned to a fixed frequency. In a __________________ radio, all tuned circuits are tuned to the *________________________________.	superheterodyne intermediate frequency

G-31 One signal in the antenna is selected by the __________. The mixer passes four signals. To select just one of these, another __________ is needed.	tuner tuner
G-32 The mixer passes on four signals, so the next component must be a ____________ to select only #____ of the 4 signals.  	tuner (tuner circuit) 1
G-33 The next component is a tuner, which is always tuned to select the same ______________.  	frequency
G-34 This second tuner is called a fixed tuned circuit because it is always _____________ to select the same ___________________.	tuned frequency (signal)
G-35 The component following the mixer is always tuned to the ________________ frequency, abbreviated I.F., which is always *________ ______________.	intermediate the same

G-46	The antenna picks up __________ from all nearby stations. As you turn the knob which adjusts the _________, only one of these __________ is selected.  	signals (currents) tuner signals (frequencies)
G-47	As the tuner is changed, the local oscillator also changes. In this way, the difference between the two signals, that is the *______ __________________, remains constant.	intermediate frequency
G-48	The ________ passes signals to the *__________________________, which passes only one signal, the $_____ signal.	mixer tuned I.F. circuit I.F.
G-49	Most radios mix two signals to produce a constant *____________________________ signal. Because it works on this principle, such a radio is called a ______________________ radio.	intermediate frequency superheterodyne
G-50	In a superheterodyne radio, the tuner and oscillator operate together, so that the difference signal they send to the _________ is always *______________.	mixer the same

G-36 The circuit following the mixer is called the tuned I.F. circuit. The *______________ selects the ____________ frequency.	tuned I.F. circuit intermediate
G-37 The component following the mixer is the *________________. It selects the $____ signal, which is always *__________.	tuned I.F. circuit I.F. the same
G-38 The first component after the antenna is the ________. It sends a signal to the ________, which also receives a signal from the *________ ____________.	tuner mixer local oscillator
G-39 The signals from the tuner and local oscillator are combined by the ________ which sends #____ signals to the *________________.	mixer 4 tuned I.F. circuit
G-40 Four signals are sent by the ________ to the *________________, which passes only the *________________ signal.	mixer tuned I.F. circuit intermediate frequency

G-41 Write the names of each component in the appropriate block.  	 tuner mixer tuned I.F. circuit local oscillator
G-42 The combining of tuner and oscillator signals to produce a constant intermediate frequency is called the superheterodyne principle (super-het-ero-dine). Most radios use the ________________ principle.	superheterodyne
G-43 Radios using the ____________________ principle need to work with only ______ frequency past the tuned I.F. circuit, since this signal always has the * __________________________.	superheterodyne one same frequency
G-44 A radio using the superheterodyne principle works better because it works on a constant intermediate _______________. Most radios now use the ___________________ principle.	frequency superheterodyne
G-45 The principle of a _________________ radio involves mixing two signals, from the tuner and local oscillator, and then passing on only the * ___________________________ signal.  tuner mixer tuned I.F. circuit I.F. local osc.	superheterodyne intermediate frequency

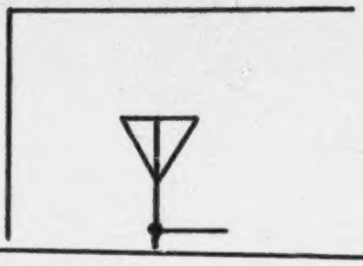
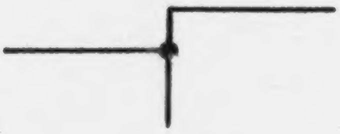
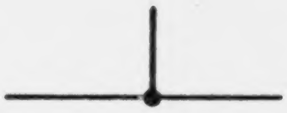
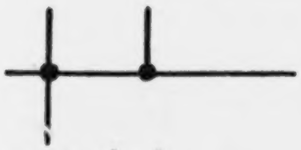
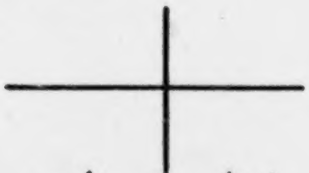
Now turn the book around so the items on the opposite page are right side up. Then begin with Item number 41 and continue on the right hand pages until you reach the end of this unit.

UNIT H

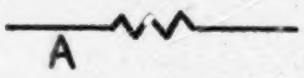
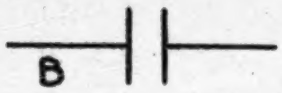
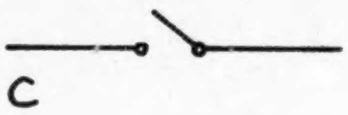
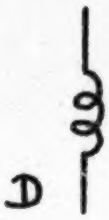
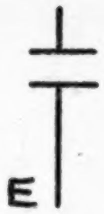
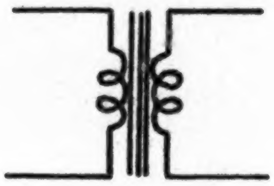
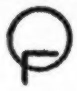
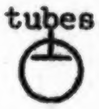
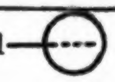
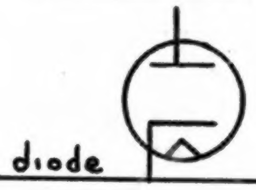
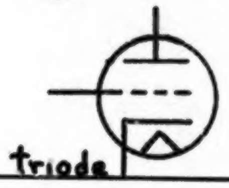
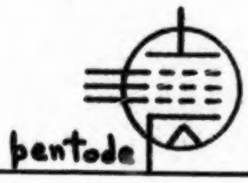
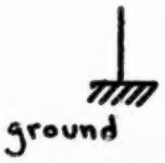
RADIO CIRCUIT DIAGRAM

Unit H begins on the next page. Use the cardboard mask as you have done before. Read only the right hand pages.

You have now finished this unit. Turn the book around and go on to the next unit.

H-1 Tear out the last sheet in this book, labeled Radio Circuit Diagram. Put the Radio * ________ ____________ on the table beside you.	Circuit Diagram
H-2 Find this symbol in the upper left hand corner of the * ______________________________ Diagram. This is the symbol for the __________. 	Radio Circuit antenna
H-3 Look at the various other symbols on the diagram. A straight line means a wire or other ____________________. 	conductor
H-4 In the diagram, two wires are sometimes connected. The figure shows a connection. A dot means the ____________ are ______________. 	wires connected
H-5 Lines crossing in the diagram are connected if they have a ________, but if there is no dot, they are ________ connected.  connected  not connected	dot not

END OF PROGRAM

H-6 You already know most of the other symbols used in the diagram, such as figure A which is a __________ and figure B which is a __________.  	resistor capacitor
H-7 Figure C is a __________, figure D is a __________, and figure E is a * __________ __________.   	switch coil variable capacitor
H-8 This figure shows two coils together, side by side, which is a __________. 	transformer
H-9 These figures show a diode, a triode, and a pentode. They are all vacuum tubes. In them,  means __________,  means __________, and  means __________.   	cathode plate grid
H-10 This is the symbol for "ground". In a radio, a piece of metal is used as a terminal to establish voltage, that is, as a __________. 	ground

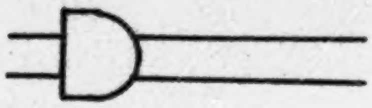
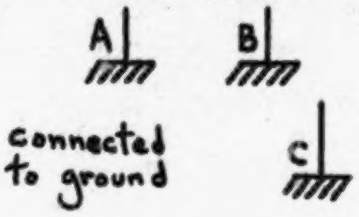
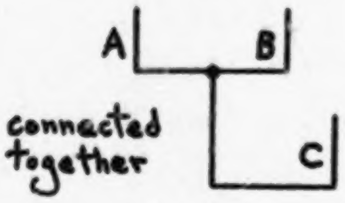
H-71 Your Radio Circuit Diagram now has #_____ circuits circled and labeled. These circuits plus the antenna and speaker make up a radio built on the ____________________ principle.

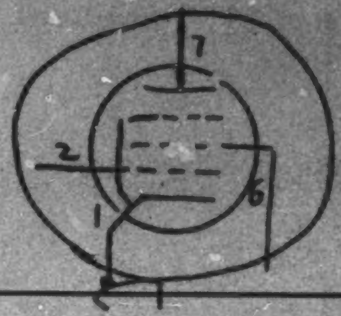
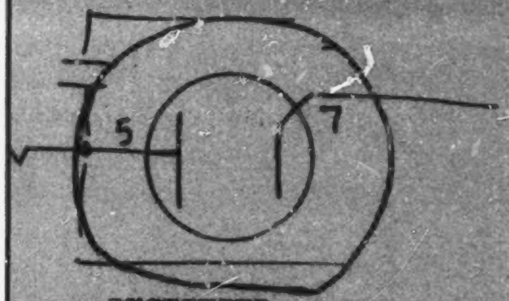
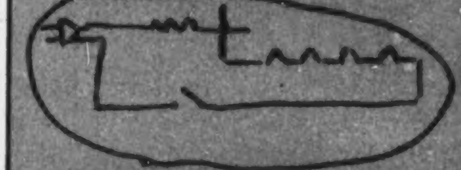
8

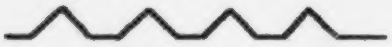
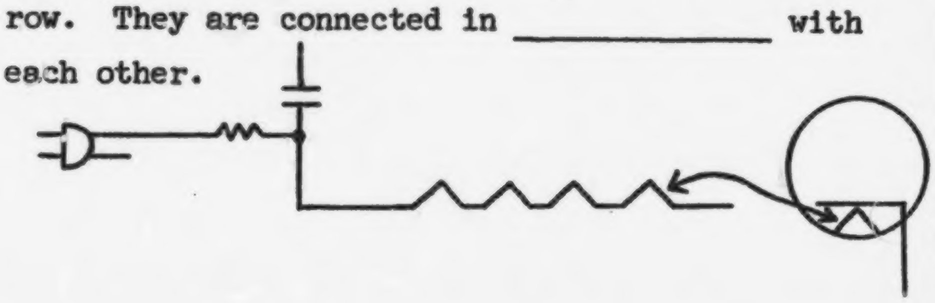
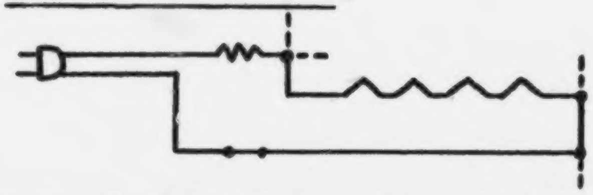
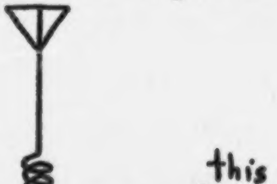
superheterodyne

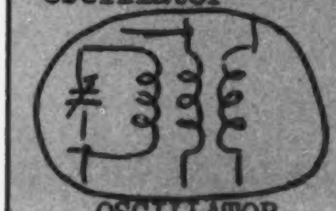
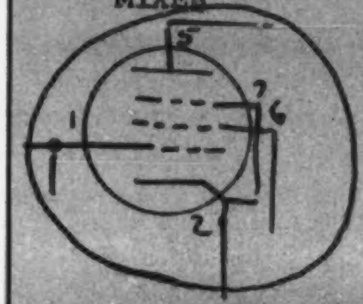
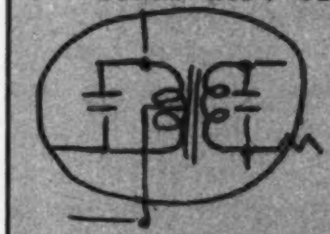
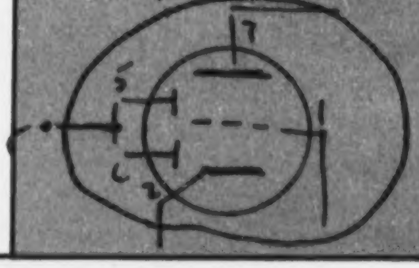
Insert the circuit diagram back in the book and save it for future reference. You have completed the program.

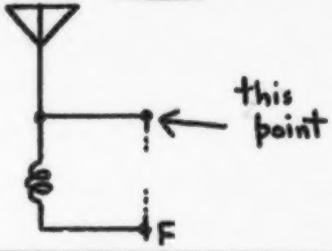
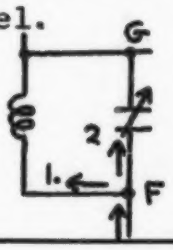
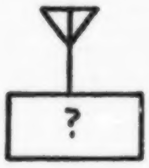
END OF UNIT

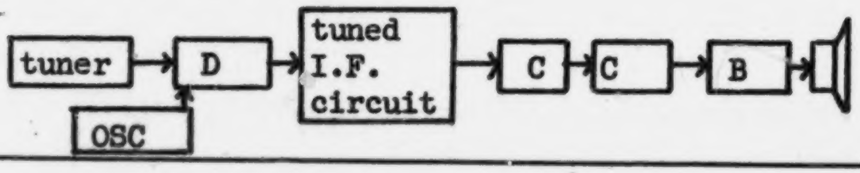
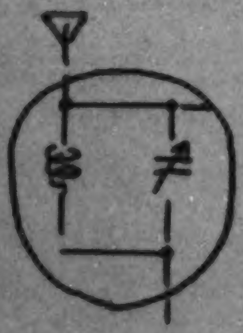
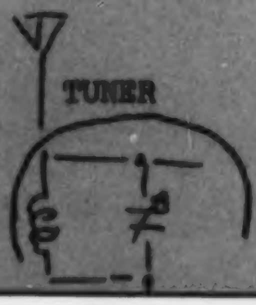
H-11 Near the lower center of the diagram is this symbol, meaning a wall plug. This represents a *____________________ which is a source of alternating ______________. 	wall plug current
H-12 From the plug, two wires go toward the right. The upper wire goes first to a ______________; the lower wire goes first to a _____________.	resistor switch
H-13 From the switch, the lower wire connects with another ____________. Directly below their connection is the symbol ⏚ , and the word _____________.	wire ground
H-14 Ground is a conductor, so that all wires connected to ground are actually _____________ to each other.  	connected
H-15 The upper wire from the plug crosses another wire and is ______________ to it. From the meeting point, one wire goes up to a _______________.	connected capacitor

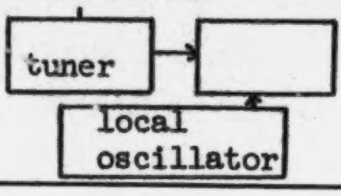
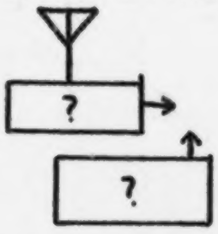
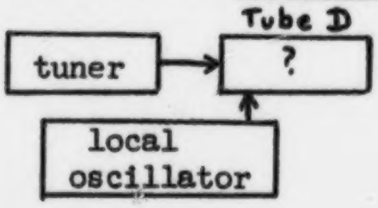
H-66	The last component before the loud speaker is Tube B, which is the * ______________________ ________________. Circle this tube and label it.	2nd audio amplifier 2ND AUDIO AMPLIFIER 
H-67	The last major component in the radio is Tube A, which is a ______________ used as a rectifier that converts * __________________.	diode AC to DC
H-68	Circle Tube A and label it RECTIFIER.	 RECTIFIER
H-69	To the right of Tube A are the symbols for the four tube ________________. They are all connected in _____________.	filaments series
H-70	The filament circuit has a switch, one ________________, and four tube ______________ connected in series. Circle and label the FILAMENT CIRCUIT on the diagram.	resistor filaments  FILAMENT CIRCUIT

H-16 Another wire goes down to the ∧ symbols which represent the filaments that heat the ________________ in the vacuum tubes. 	cathodes
H-17 The four tube ______________ are shown in a row. They are connected in ____________ with each other. 	filaments series
H-18 A circuit is a closed path through which ____________ can flow. When the switch is closed, this part of the diagram represents a closed _______________. 	current circuit
H-19 The tube shown near the filament circuit is a _________, which is a rectifier that ** ______ ______________________________.	diode converts AC to DC
H-20 The antenna in the upper left is connected to a _________ directly below it, which then is connected to another wire at a point marked with the letter $ ___.  	coil F

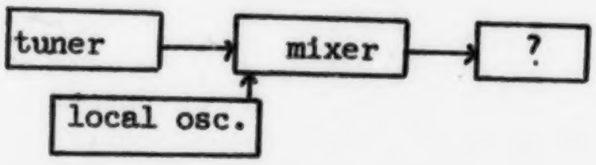
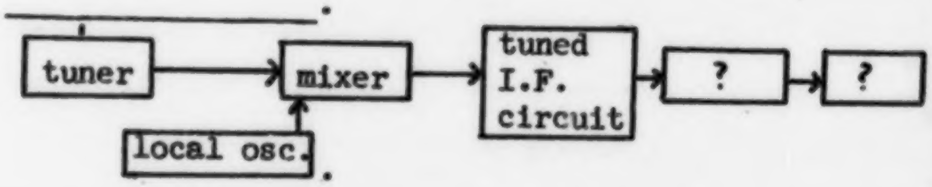
H-61 The three oscillator coils and the variable capacitor near them are the major parts of the local ________________ circuit. Circle them and label this circuit beneath the circle.	oscillator  OSCILLATOR
H-62 Signals from the tuner and local oscillator go to Tube D, which is the main part of the ____________ circuit. Circle the tube and add a label above the circle.	mixer MIXER 
H-63 The I.F. transformer and two capacitors are the main parts of the next circuit after the mixer, called the *________________________. Circle and label it.	tuned I.F. circuit TUNED I.F. CIRCUIT 
H-64 Following the tuned I.F. circuit is Tube C which acts as the next two components. Tube C is both the ______________ and the *________________ __________________.	detector 1st audio amplifier
H-65 Circle Tube C on the diagram and write above it, DETECTOR/1ST AUDIO AMPLIFIER.	DETECTOR/1ST AUDIO AMPLIFIER 

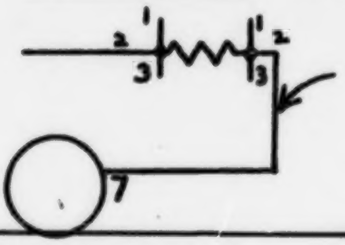
H-21 The upper end of the antenna coil is connected to a point marked with the letter $____. Connected directly between points F and $____ is a variable ________________. 	G G capacitor
H-22 From point F to point G, AC current can follow either of two different paths, since the antenna ________ and a * ____________________________ are connected in parallel. 	coil variable capacitor
H-23 A coil and a variable capacitor, connected in parallel, make up the first circuit of the radio, which is called a ____________. 	tuner
H-24 A dotted line connects the tuner variable capacitor with another * ____________________________. It means that the tuning knob changes both * __________________________ at the same time.	variable capacitor variable capacitors
H-25 The tuner variable capacitor is connected by a dotted line to another variable capacitor near the words __________ coil, which is an abbreviation for ________________ coil.	OSC oscillator

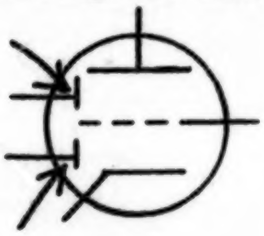
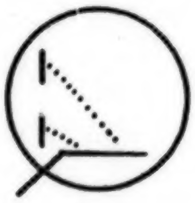
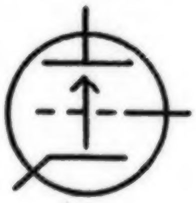
H-56 Tubes B and D have #____ grids. Tube C is a __________, which has only *______________.	3 triode one grid
H-57 Tubes D, C and B all increase the size of current fluctuations, so you know that all three of these tubes are _________________.	amplifiers
H-58 As shown in the figure, Tube D is the _________, Tube C is both the ______________ and the *________________________ and Tube B is the *_____________________________.  tuner D OSC tuned I.F. circuit C C B	mixer detector 1st audio amplifier 2nd audio amplifier
H-59 Now use your pencil to circle each major circuit in the radio. Just beneath the antenna is the _________ circuit. Put a circle around it.	tuner 
H-60 Now label the circuit you just circled by writing the word TUNER just above the circle.	

H-26 As the tuning knob is turned, two * ______________ ______________ change together. This is because the local oscillator frequency and the __________ frequency must be changed together.  	variable capacitors tuner
H-27 The tuning knob changes the capacitance of two variable capacitors; one is in the __________, and the other is in the * ________________.  	tuner local oscillator
H-28 The tuner and local oscillator are tuned together so that the ______________ between their frequencies is always the same. The resulting signal is called the $_____ signal.	difference I.F.
H-29 Both the tuner and the local oscillator are connected to Tube D, which acts as the next component, the __________.  	mixer
H-30 From the diagram, you can see that the plate of Tube D is connected to one of the two coils which make up the * ______________________.	I.F. Transformer

H-51 At the other end of the 5.6 kΩ resistor, one wire connects to a #____ mfd capacitor and one goes to terminal 6 of Tube $____.	20 B
H-52 The last wire from the 5.6 kΩ resistor goes across to the left where it splits at point $____.	Q
H-53 From point Q, one wire goes left and up where it connects to one of the ________ of the local ____________.	coils oscillator
H-54 The other wire from point Q goes up to terminal #____ of the part marked CR-150.	7
H-55 Tubes have different numbers of grids, depending upon their purpose. Tube A is a __________, which has ______ grids.	diode no

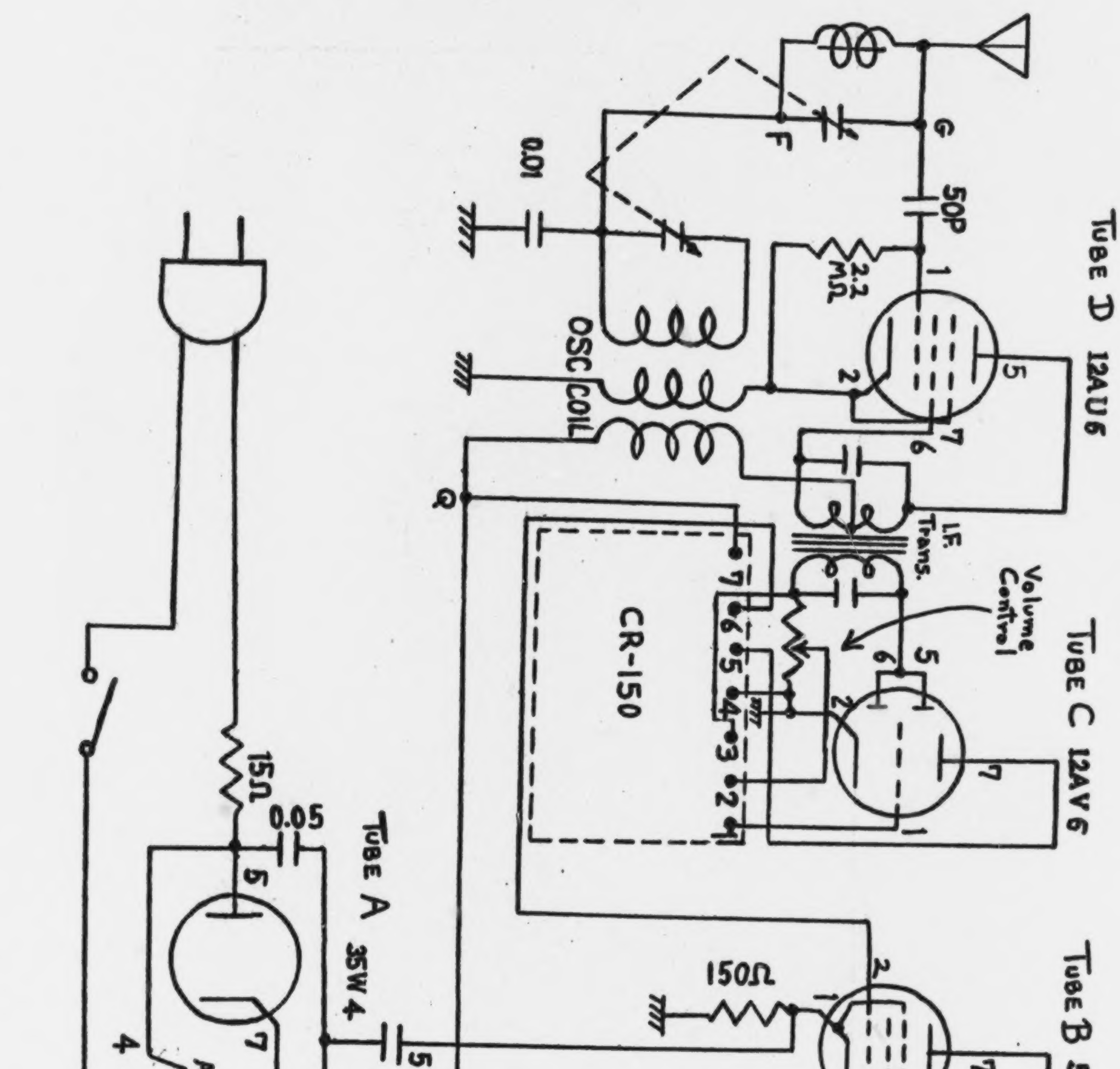
H-31 Each coil of the I.F. transformer has a __________ connected in parallel with it. A coil and a __________________ in parallel is a ____________ circuit.	capacitor capacitor tuner (tuned)
H-32 Each half of the I.F. transformer is a tuner circuit. Thus, the I.F. transformer is a basic part of the radio's tuned * ____________________. 	I.F. circuit
H-33 The tube to the right of the I.F. transformer is labeled $____. At the top of the tube is the ___________, at the bottom is the ____________.	C (12 AV6) plate cathode
H-34 Tube C serves two purposes. First, it acts as the detector which separates the I.F. signal from the ____________ signal.	audio
H-35 Tube C is the ______________, which separates the audio and I.F. signals. Tube C also is part of the next circuit, which is the 1st * __________ ________________.  tuner mixer tuned I.F. circuit ? ? local osc.	detector audio amplifier

H-46 In the local oscillator, two of the #___ coils are connected to ground. Connected in series between one coil and ground is a ______________.	3 capacitor
H-47 The plate of Tube D is connected to one of the __________ of the I.F. _______________.	coils transformer
H-48 Above the part of the diagram that includes the diode and the four filaments is a resistor marked 5.6 kΩ , which means a _____________ of 5,600 _______.	resistance ohms
H-49 Each end of the 5.6 kΩ resistor is connected to #___ wires. One wire is connected to terminal 7 of the __________, which is its ____________. 	3 diode cathode
H-50 The same end of the 5.6 kΩ resistor that is connected to the diode cathode is connected to terminal B of the *______________________, and to a 40 mfd _____________.	speaker transformer capacitor

H-36	Tube C is basically a triode, with a cathode, plate and __________. At the left it also has two small symbols representing two additional ____________. 	grid plates
H-37	The two small plates and the cathode are in the circuit that separates the audio signal from the I.F. signal, that is, they are the ____________. 	detector
H-38	In part, Tube C is the detector, which separates the * ______________________ from the * _________ ____________.	audio signal I.F. signal
H-39	The ____________ signal from the detector then goes through Tube C again, through the triode section. A triode, you remember, is an ________________. 	audio amplifier
H-40	Tube C is the detector, and it is also the next component, the * ______________________________.	1st audio amplifier

H-41	The part of the diagram labeled CR-150 is a complex radio part containing resistors and capacitors. As shown in the diagram, the CR-150 has #_____ connections.	7
H-42	By following the line from the plate of Tube C, you can see that the amplified ___________ signal goes to terminal #____ of the CR-150 block.	audio 5
H-43	The audio signal goes to terminal 5 of the CR-150. The signal leaves the CR-150 from terminal 6 and goes to the _________ of Tube $____.	grid B
H-44	Tube B is the 2nd *_______________________. As shown in the diagram, the plate of Tube B is connected to the speaker _________________.	audio amplifier transformer (coil)
H-45	The circuit diagram indicates all connections in the radio. The plate of Tube B, for example, connects to terminal $____ of the *___________ _____________________.	P speaker transformer

Now turn the book around so the items on the opposite page are right side up. Then begin with Item number 41 and continue on the right hand pages until you reach the end of this unit.


TUBE D 12AU6
50P
G
F
0.01
2.2 MΩ
1
2
5
6
7
OSC COIL
Q
I.F. Trans.
Volume Control
TUBE C 12AV6
5
6
2
7
1
CR-150
7 6 5 4 3 2 1
TUBE B 50C5
150Ω
1
2
7
6
5.6KΩ
.01
B
P
Speaker transformer
TUBE A 35W4
15Ω
0.05
5
7
5
20
40
A B C D
4 343 34 34
Ground

RADIO CIRCUIT DIAGRAM